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Final Remedial Action Reports

Spokane River Beach Cleanup Sites

Spokane County, Washington

September 25, 2014

Prepared for:

U.S. Environmental Protection Agency

Region 10

Prepared by:

U.S. Army Corps of Engineers

Seattle District

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Date: 9/25/14

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1. Introduction

This Remedial Action Report documents the cleanup activities that occurred in order to fully implement the remedial actions at the Spokane River Beach Cleanups. The remedial activities were completed between 2006 and 2012 to isolate and stabilize metals-impacted beach sediments at recreational areas along the Spokane River from the Washington-Idaho border to Donkey Island in Spokane Valley, Washington. The Washington State Department of Ecology (Ecology or State) and U.S. Environmental Protection Agency (EPA) implemented the cleanup actions as part of the overall EPA Record of Decision (ROD) for the Bunker Hill Mining and Metallurgical Complex- Operable Unit (OU) 3 (also referred to here as Coeur d'Alene ROD OU3). The goal for the selected remedy for the Spokane River was to reduce human health and ecological exposures at selected shoreline and/or subaqueous sediment depositional areas. The selected remedy for shoreline and subaqueous sites called for a combination of capping, removals, and performance monitoring.

1.1. Background

The project consisted of a series of ten shoreline cleanup sites located along the Spokane River and one subaqueous site where contaminated sediments had accumulated directly behind Upriver Dam. The cleanup sites include:

1) Island Complex
2) Starr Road
3) Murray Road
4) Harvard Road
5) Barker Road North
6) Flora Road
7) Myrtle Point
8) Islands Lagoon
9) Barker Road South
10) Donkey Island
11) Upriver Dam

Shoreline Cleanup Sites

Bank sediments at these sites were contaminated with heavy metals associated with mining activities in Idaho at the Bunker Hill Mining and Metallurgical Complex Superfund Site. These sites were identified for remedial action based on potential human (recreational use) and ecological exposures. All sites are used by the public for boating access, swimming and picnicking. Remedial actions included a combination of excavation and disposal, limited re-grading for slope stability, capping, and/or habitat restoration and institutional controls.

The intent of these projects was to stabilize the metals-contaminated sediment with appropriately sized rock and riparian vegetation (capping) and to maintain access for river users in a manner that is consistent with the ROD. Of specific concern were arsenic and lead concentrations in beach sediments that were greater than established action levels. Key elements of the remedial design at each site included:

- Sampling and analysis within the area of defined primary and accessible recreational use to determine the appropriate capping area.
- Hydraulic modeling to determine river flow velocities to establish the appropriate gradation of the cap material and to establish the maximum increase in elevation of the cap material to prevent a rise in base flood elevations greater than 0.1 feet.

The remedial action design was completed in general accordance with the requirements of the ROD. However, Ecology paid for and implemented additional actions (capping at Island Complex, post-excavation capping at Flora Road, signage at Barker Road South) not required by the ROD; some areas of these sites had sediment arsenic concentrations above 10 mg/kg, but below 20 mg/kg (see Cleanup Levels below for description of arsenic cleanup levels).

Upriver Dam

The Coeur d'Alene ROD for OU3 identified 10 shoreline cleanup areas along the Spokane River and a subaqueous site where contaminated sediments have accumulated directly behind Upriver Dam. The State has taken cleanup action on these subaqueous sediments using polychlorinated biphenyls (PCBs) as the cleanup driver. These sediments were located in the low-energy impoundment behind Upriver Dam and have been associated with the downstream transport of sediment-bound PCBs originating from point and non-point sources to the Spokane River. It is also assumed that these subaqueous sediments are also contaminated with metals from upstream mining wastes. This area was identified for remedial action for subaqueous metals along with the 10 beach cleanups in the Coeur d'Alene OU3 ROD. . Remedial actions completed by the State for PCB-contaminated sediment included a combination of capping, excavation and disposal, and/or institutional controls.

The intent of this cleanup by the State was to provide a safer environment for humans and wildlife that may use the area by capping or removing contaminated sediments. Key elements of the remedial design at Upriver Dam included:

- Sampling and analysis of sediments to determine the appropriate capping or excavation areas.
- Precision hydraulic placement of capping materials.

EPA's Coeur d'Alene Basin Remedial Investigation/Feasibility Study focused on heavy metal contamination in the Basin without specifically addressing PCB-contaminated sediment deposits located upstream of the Spokane River Upriver Dam since PCBs are not a contaminant of concern for Coeur d'Alene. Known sources of PCBs to Upriver Dam are the Spokane Industrial Park, Kaiser Trentwood Works, the Liberty Lake Sewage Treatment Plant, and Inland Empire Paper Company paper plant; this is a separate issue from the mining-related contamination addressed in the Coeur d'Alene OU3 ROD. Ecology, as the lead agency responsible for overseeing the cleanup of PCBs on the river, initiated the characterization of sediment deposits containing PCBs in the impoundment area. In coordination with Ecology, EPA is planning on sampling sediments for Upriver Dam as part of a separate action from the Spokane River Beach Cleanups (but still under the Coeur d'Alene ROD OU3) and making a separate cleanup decision for any remaining metals-contaminated sediment at Upriver Dam.

1.2. Cleanup Levels

Shoreline Cleanup Sites

Per the Coeur d'Alene OU3 ROD, the cleanup level for lead was 700 mg/kg. The ROD's risk-based concentration for arsenic was 10 mg/kg; however, this risk-based concentration for arsenic in sediment is based on background, not risk. There was no arsenic cleanup level established in the ROD.

EPA established a 20 mg/kg cleanup level for arsenic based on Model Toxics Control Act (MTCA) unrestricted land use, even though this value falls below a recreational risk-based concentration and sediment background values used by EPA in the Coeur d'Alene Basin (Terragraphics et al. 2001, URS Greiner Inc. and CH2MHill 2001).

As a background level, EPA determined that 10 mg/kg for arsenic is biased low because it is based on the 90th percentile value of soils in Spokane County and does not reflect the higher mineralization present in the Coeur d'Alene district, which flows into the Spokane River (Gott and Cathrall 1980, Washington Department of Ecology 1994). The 90th percentile for arsenic in the Coeur d'Alene district is 22 mg/kg, based on 8,265 soil samples, or 24 mg/kg, based on 3,969 rock samples, analyzed by the U.S. Geological Survey (Gott and Cathrall) 1980). EPA used a background arsenic sediment concentration of 35 mg/kg for arsenic at the 95th percentile in the Expedited Screening Level Risk Assessment for recreational areas in the Coeur d'Alene River Basin (EPA 2002). A risk-based concentration protective for arsenic was estimated at 23 mg/kg, but was not used in the Coeur d'Alene assessment because it fell below the estimated background concentration.

Upriver Dam

As noted previously, PCBs are a separate issue from the mining-related contamination addressed in the Coeur d'Alene OU3 ROD. The ROD, therefore, did not specify cleanup levels for PCBs at Upriver Dam. Ecology, as the lead agency responsible for overseeing the cleanup of PCBs on the river, initiated the characterization of sediment deposits containing PCBs in the impoundment area.

Ecology selected a value of 62 µg/kg as the sediment cleanup level for PCBs. This sediment cleanup level was based on the lowest Apparent Effects Threshold (AET) for use in freshwater sediments as recommended by Michelson (2003). The freshwater sediment criteria described in Michelson (2003) were proposed to Ecology for rule adoption; however, the criteria were never formally adopted by Ecology. At the time of the cleanup action, the Sediment Management Standards' (SMS) default point of compliance for sediment and surface water cleanup levels is the 0 to 10 cm depth interval below the mudline. Radioisotope dating evaluations support that the biologically active zone in the contaminated sediments does not extend below the 10 cm interval, and in several cores is limited to the 0 to 4 cm interval. Use of a default 0 to 10 cm point of compliance in the sediment cleanup level provides an additional level of protectiveness to address potential future improved conditions at the Site.

A value of 64 pg/L PCBs was selected by Ecology as the surface water cleanup level. . The point of compliance for surface water is the point or points at which hazardous substances are released to surface waters of the state.

1.3. Report Overview

The content of the Remedial Action Report is consistent with Section 2.0 of EPA's Close Out Procedures for National Priorities List Sites (EPA 2011). The body of the report is split into sections 2-12, describing in detail each project site:

2) Island Complex
3) Starr Road
4) Murray Road
5) Harvard Road
6) Barker Road North
7) Flora Road
8) Myrtle Point
9) Islands Lagoon
10) Barker Road South
11) Donkey Island
12) Upriver Dam

The general locations of the sites are shown in Figure 1. On the figure, the locations Plante Ferry Park and Centennial Bridge/Islands sites represent the locations of the Myrtle Point and Islands Lagoon sites, respectively. As-built drawings are included as appendices to each section.

1.4. Documents Reviewed

With the exception of the Starr Road, Barker Road South, Donkey Island, and Upriver Dam , each Remedial Action Report is primarily based on Construction Completion Reports completed by a contractor for the Washington Department of Ecology (GeoEngineers, 2013). Documents reviewed in the preparation of this report are identified below:

Anchor QEA 2009. *Memorandum Year 2 Upriver Dam Cap Monitoring Results*. Prepared by Anchor QEA for Avista Development, Inc. April 2009.

GeoEngineers 2013. *Capping Construction Completion Report Spokane River Beach Cleanup Sites Spokane County, Washington*. Prepared by GeoEngineers, Inc., for Washington Department of Ecology. July 2013.

GeoEngineers 2012. *90 Percent Design River Sediment Capping Design Spokane River Beach Cleanup Sites Barker Road North Project Site Spokane County, Washington*. Prepared by GeoEngineers, Inc. for Washington Department of Ecology. May 2012.

GeoEngineers 2012. *90 Percent Design River Sediment Capping Design Spokane River Beach Cleanup Sites Flora Road Project Site Spokane County, Washington*. Prepared by GeoEngineers, Inc. for Washington Department of Ecology. May 2012.

GeoEngineers 2012. *90 Percent Design River Sediment Capping Design Spokane River Beach Cleanup Sites Islands Lagoon Project Site Spokane County, Washington*. Prepared by GeoEngineers, Inc. for Washington Department of Ecology. May 2012.

GeoEngineers 2012. *90 Percent Design River Sediment Capping Design Spokane River Beach Cleanup Sites Myrtle Point Project Site Spokane County, Washington*. Prepared by GeoEngineers, Inc. for Washington Department of Ecology. May 2012.

Gott, G., Cathrall, J. 1980. *Geochemical-Exploration Studies in the Coeur d'Alene District, Idaho and Montana*. Geological Survey Professional Paper 1116. U.S. Department of the Interior.

Michelson, T. 2003. *Development of Freshwater Sediment Quality Values for Use in Washington State, Phase II, Report. Development and Recommendation of SQVs for Freshwater Sediments in Washington State*. Prepared by Avocet Consulting for Washington Department of Ecology.

Terragraphics, URS Greiner Inc., and CH2MHill 2001. *Final Human Health Risk Assessment for the Coeur d'Alene Basin*. June 2001.

U.S. Army Corps of Engineers 2008. *Construction Completion Report Washington Recreation Areas – Starr Road Spokane County, Washington*. Prepared by U.S. Army Corps of Engineers, Seattle District for U.S. Environmental Protection Agency. January 2008.

U.S. Army Corps of Engineers 2007. *Final Field Report Washington Recreation Sites, Starr Road – Spokane, WA*. Prepared by Bay West, Inc. for U.S. Army Corps of Engineers, Seattle District. April 2007.

U.S. Army Corps of Engineers 2006. *Final Remedial Action Management Plan Washington Recreation Sites, Starr Road – Spokane, WA*. Prepared by Bay West, Inc. for U.S Army Corps of Engineers, Seattle District. June 2006.

U.S. Environmental Protection Agency 2012. *US EPA Comments; 90% Remedial Designs for the Barker Road, Centennial Bridgelands, Plante Ferry Park and Flora Road South, Bunker Hill Mining and Metallurgical Complex Operable Unit (OU) 3*. U.S. Environmental Protection Agency Office of Environmental Cleanup. June 2012.

U.S. Environmental Protection Agency 2011. *Close Out Procedures for National Priorities List Sites*. Office of Superfund Remediation and Technology Innovation. OSWER Directive 9320.2-22. May 2011.

U.S. Environmental Protection Agency 2002. *Record of Decision Bunker Hill Mining and Metallurgical Complex OU 3*. September 2002.

URS Greiner Inc. and CH2MHill 2001. *Final (Revision 2) Remedial Investigation Report, Remedial Investigation Report for the Coeur d'Alene Basin Remedial Investigation/Feasibility Study, Vol. 4. Part 3. CSM Unit 2, Midgradient Watersheds, South Fork Coeur d'Alene River*. Prepared for EPA Region 10. October 2001.

Washington Department of Ecology 2013. *Monitoring, Sampling, and Analysis Plan Spokane River Shoreline Sediment Sites Spokane, WA*. Washington Department of Ecology, Toxics Cleanup Program. September 2013.

Washington Department of Ecology 2008. *Specifications for Harvard Road North Remedial Action*. July 2008.

Washington Department of Ecology 2007. *Specifications for Island Complex and Murray Road Remedial Actions*. August 2007.

Washington Department of Ecology 2006. *Sampling and Testing Report Spokane River Shoreline Site at Barker Road South Spokane, WA*. Washington Department of Ecology, Toxics Cleanup Program. December 2006.

Washington Department of Ecology 2006. *Sampling and Testing Report Spokane River Shoreline Site at Donkey Island Spokane, WA*. Washington Department of Ecology, Toxics Cleanup Program. October 2006.

Washington Department of Ecology 2006. *Fact Sheet Upriver Dam PCBs Sediments Site Engineering Design Report Available for Review and Comment*. Washington Department of Ecology, Toxics Cleanup Program. June 2006.

Washington Department of Ecology 1994. *Natural Background Soil Metals and Concentrations in Washington State*. Washington State Department of Ecology, Toxics Cleanup Program. October 1994.

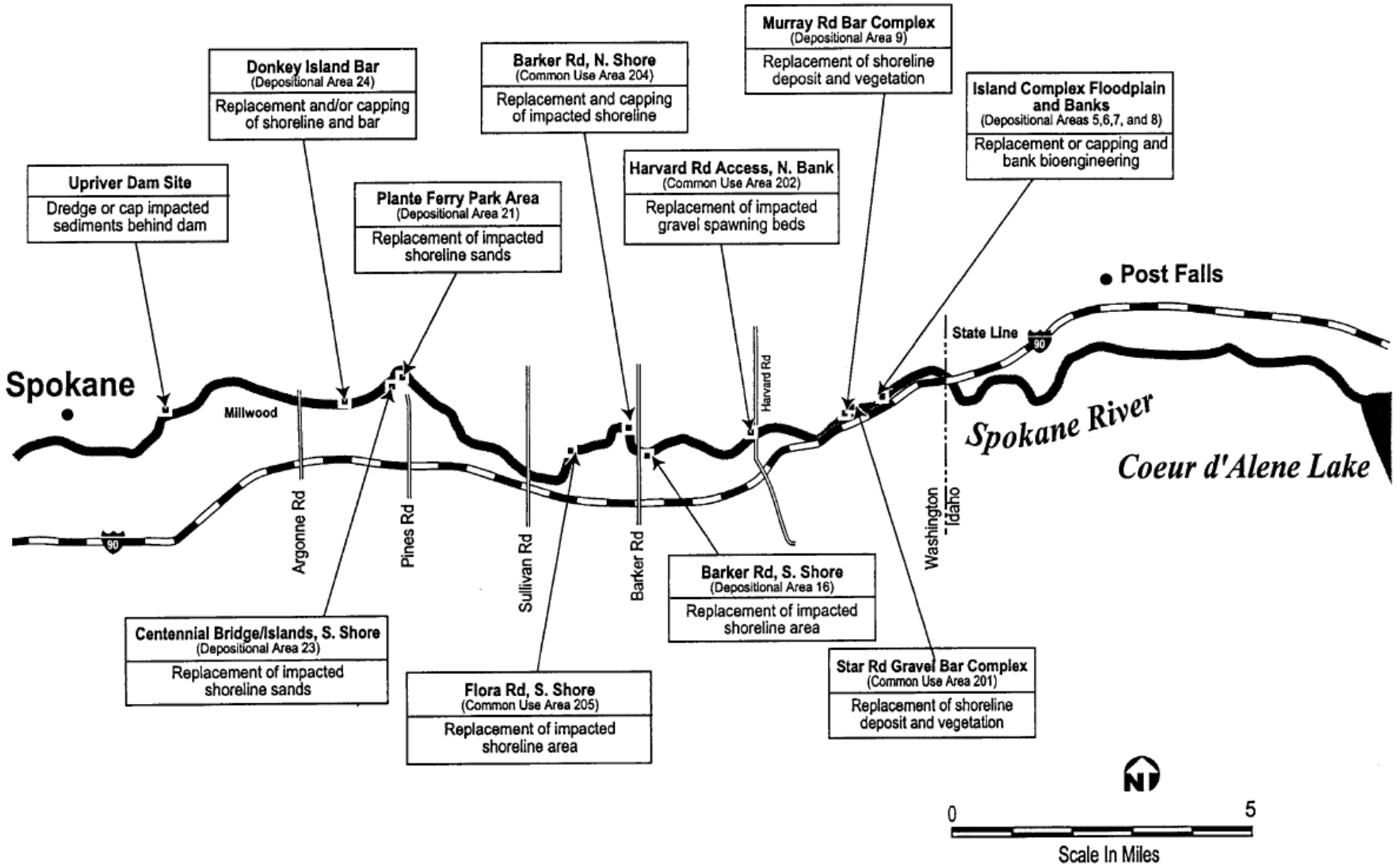


Figure 1. General location of the Spokane River Beach Cleanup Sites

Island Complex Remedial Action Report

2. Island Complex Remedial Action Report

2.1. Background

The Island Complex Beach Area is located on the south side of the Spokane River, about one mile west of the Idaho-Washington border in Spokane County (approximately river mile 95). The site is located on Washington State Parks recreational land and Washington Department of Natural Resources aquatic lands, and is adjacent to the Centennial Trail bicycle and pedestrian path.

The Remedial Action at Island Complex consisted of placement of capping materials in four sections within the project site. Key elements of the different sections of the remedial design included:

- The first section extends along approximately 3,300 square feet of river bank and was capped using layered rock including four- to six-inch angular quarry spalls, 3-inch-minus rounded river rock, and 1-inch-minus rounded rock.
- The second section, approximately 6,400 square feet directly upslope from the first section, was capped using erosion control coir fabric, topsoil, and native vegetation.
- The third section extended approximately 1,200 square feet along the southern river bank portion of the site and was capped with six- to ten-inch river cobble.
- The fourth section, approximately 2,000 square feet of trail leading to the site, was amended with approximately six inches of 3/8-inch-minus crushed gravel.

The remedial action design was completed in general accordance with the requirements of the ROD.

2.2. Construction Activities

Pre-construction Sampling

In 2006, five samples were collected within the back channel portion of the site boundaries to further explore and characterize sediment contamination. Although, results indicated that no samples exceeded the cleanup levels for Spokane River project sites in Washington for lead (700 mg/kg) no conclusions can be drawn regarding arsenic because the detection limits were above the screening levels. While EPA would not have taken action to cleanup soils less than 20 mg/kg arsenic, the state of Washington made the decision to cap soils above 10 mg/kg.

Bidding/Contractor Selection

Ecology bid the project in 2007. The construction contract was awarded to Ridolfi Inc., who implemented the remedial action.

Health and Safety

Project activities were completed in accordance with health and safety requirements contained in the contract specifications, which required use of HAZWOPER-trained staff. Contractors prepared and implemented their own health and safety plans.

Site Access

Access to the site involved traveling approximately 0.5 miles along a trail through park land owned by Spokane County. The trailhead is located at the parking lot adjacent to the river near Exit 299 on interstate I-90. During periods of seasonal low flow (late summer and fall), the riverbed channels around the island are dry and the site is accessible by foot and equipment.

Erosion and Sediment Control

Coir fabric was installed to provide filtering and erosion control.

Cap Area

The cap area was delineated by the Ecology field representative. Minor adjustments relative to the cap design limits were made based on field conditions encountered. The contractor's surveyor maintained vertical and horizontal control over the cap area throughout construction.

Archaeological observation

No records of archaeological observation were available for the Island Complex site at the time of this report.

Cap Material

Four- to six-inch quarry spalls, 1-inch-minus, 3/8-inch crushed rock, and topsoil were delivered and stockpiled on the Island Complex uplands between September 8, 2007 and September 13, 2007. Import material was visually inspected and approved by Ecology's field personnel prior to placement.

Capping Material Placement

The project design specified 6 to 24 inches of capping material over approximately 10,000 square feet. The capping area was divided into four sections. The first area extends along approximately 3,300 square feet of river bank and was capped using layered rock including four- to six-inch angular quarry spalls, 3-inch-minus rounded river rock, and 1-inch-minus rounded rock. The second section, approximately 6,400 square feet directly upslope from the layered rock area, was capped using erosion control coir fabric, topsoil, and native vegetation. The third section extended approximately 1,200 square feet along the southern river bank portion of the site and was capped with six- to ten-inch river cobble. The fourth section, approximately 2,000 square feet of trail leading to the site, was amended with approximately six inches of 3/8-inch-minus crushed gravel.

Survey

Following the placement of capping material, a final survey was completed to verify horizontal and vertical design limits. Survey results indicated the final thickness and capping area were in accordance with the project design plans and specifications.

Riparian Vegetation Planting

The project plan included a native riparian vegetation planting plan for the capping area as well as a portion of the site along a seasonal back channel. Five species of trees, five species of shrubs, and seven species of ground cover were planted in the capping area. Vegetation and a temporary irrigation system were installed by the Washington Conservation Corps in accordance with Ecology's long-term irrigation and maintenance plan. Irrigation of the plantings continued for two years following remediation activities to help establish plant root systems.

Post-construction Sampling

After construction, three samples were collected from the chevron capping area on September 16, 2008 to document a baseline for performance monitoring. No samples exceeded EPA's cleanup level for arsenic (20 mg/kg).

2.3. Chronology of Events

The chronology of site activities is described in Table 2-1

Table 2-1. Chronology of Events

Date	Activities
2006	Pre-construction sampling: five samples were collected within the back channel portion of the site boundaries to further explore and characterize sediment contamination
2007	Ecology bid the project. Contract was awarded.
September 2007	The contractor mobilized to the site.
September 8, 2007	Boulder material was delivered to the site.
September 12, 2007	3-inch minus, 1-inch minus, gravel, sand, and topsoil materials were delivered to the site.
September 13, 2007	Quarry spall material was delivered to the site.
September 17, 2007	Quarry spalls were placed in the chevron area and compacted from north to south using a backhoe. The height of the quarry spalls were surveyed to document that they were within 1-foot of the ordinary high water level. The 3-inch minus rock was installed and compacted on top of and downslope of the quarry spall area using a backhoe. Erosion control coir fabric was delivered to the site and the 6-inch deep fabric "key-in" trench was started at approximate elevation of 2,028 feet.
September 18, 2007	The erosion control fabric "key-in" trench was completed. Coir fabric was installed starting at the north end of the chevron area. Topsoil was placed upslope of the rock layer to an elevation of approximately 2,028 feet throughout the chevron area. Approximately 25% of the coir fabric was staked down and keyed in. Additional topsoil was delivered.
September 19, 2007	Erosion control coir fabric installation continued from the north end of the chevron area to the south. Approximately 50% of the coir fabric was staked down and keyed in. Ecology requested the 3-inch rock and topsoil be extended further to the north.
September 20, 2007	Bank treatment including 3-inch-minus, topsoil, and coir fabric was extended north to cover unnecessary damage to existing vegetation by the contractor. The very north end was completed with only 3-inch rock per Ecology approval. The coir fabric and 3-inch-minus material installations were completed. Large rock and boulders were placed on the coir treatment. Minimal damage to coir material was

Date	Activities
	done during boulder placement and was repaired 09/24/2007.
September 24, 2007	1-inch-minus material was delivered and installed in the chevron area. Four to 6-inch cobble material was delivered and installed at the southern point of the chevron area. Geotextile fabric and 5/8-inch crushed material for the upland portion of the trail was placed.
September 25, 2007	The final survey was completed by H2 Engineering and Surveying, LLC, to record as-built horizontal and vertical limits.
September 2007	The contractor demobilized from the site.
Fall 2007	The Washington Conservation Corps completed riparian vegetation planting in the chevron area and upper bank (Zone 2) along the back channel.
Spring 2008	The Washington Conservation Corps installed a drip irrigation system to irrigate the new vegetation.
September 16, 2008	Three samples were collected from the chevron capping area to document a baseline for performance monitoring.

2.4. Performance Standards and Construction Quality Control

The construction of the remedial cap was completed in general accordance with the remedial design plans and specifications. Table 2-3 summarizes the remedial action performance metrics and field verification of design criteria and as-built conditions.

Table 2-2. Remedial Action Performance Metrics

Performance Metric	Remedial Design Criteria	Comment
Cap Area	Approximately 10,000 square feet	Final cap area measured by survey as 12,900 square feet (Appendix A).
Cap Thickness	6 to 24 inches	Confirmed by construction observation an as-built survey (Appendix A).
Cap Material Gradation	See Table 2-3	Confirmed by construction observation.
Vegetation Planting	Per design plans.	Completed by the Washington Conservation Corps, including temporary irrigation. Confirmed by construction observation.

Table 2-3. Cap Design Gradations

Sieve Size	Percent passing (%)
Topsoil Design Gradation	
½ inch	100
No. 4	97-100
No. 10	85-95
No. 30	65-80
No. 50	15-30
No. 100	0-3
Trail Cap Material 3/8-inch-minus Crushed Gravel Design Gradation	
3/8-inch	100
No. 4	44-66
No. 40	8-24

Sieve Size	Percent passing (%)
No. 200	10 (max)
Chevron Cap Material 1-inch-minus Design Gradation	
½-inch	100
1 inch	75-100
5/8-inch	50-100
No. 4	20-80
No. 40	3-24
No. 200	10 (max)
Chevron Cap Material 4- to 6-inch Angular Quarry Spall Design Gradation	
6 inch	100
4 inch	40 (max)
2 inch	5 (max)

2.5. Final Inspection and Certifications

Ecology field personnel were on site during all phases of construction activities and accepted the work completed at the site in September 2007. Project activities were completed in general accordance with health and safety requirements contained in the specifications. There were no substantial problems or deviations.

2.6. Operations and Maintenance Activities

A formal monitoring plan was finalized by Ecology in September 2013. Monitoring activities include field observations to assess cap integrity, sediment deposition patterns, and health of introduced vegetation..The plan also requires discrete sampling of surficial material (i.e., deposited on the top of the surface layer of the cap) and of sub-cobble layer material (i.e., deposited sediment not to include any of the cap material). If suitable amounts of material are not present, then a sample is not taken and it is noted in the field book. Sediment/soil samples will be analyzed for arsenic, cadmium, lead, and zinc. Monitoring activities will occur every five years (starting in 2013) or during a year in which a 40,000 cubic foot per second flow event occurs in the Spokane River.

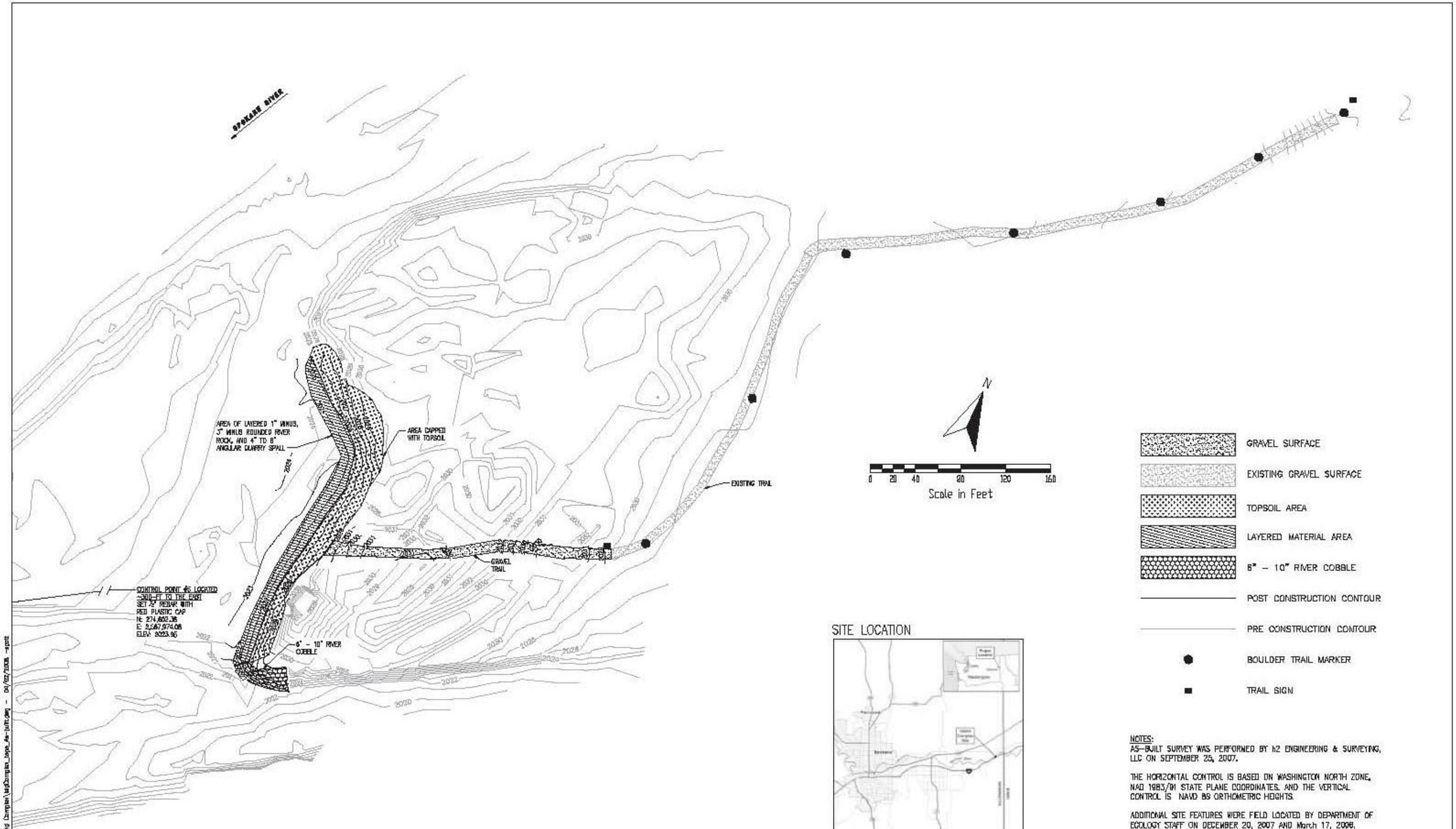
2.7. Contact Information

Table 2-4 provides contact information for the major design and remediation contractors and the state oversight lead.

Table 2-4. Contact Information

Project Role	Name	Organization	Address
Ecology Oversight	Zach Hedgpeth	Ecology	Eastern Region Office 4601 North Monroe Street Spokane, WA 99205
Project Engineer	Megan Hilgart	Ridolfi Inc.	1011 Western Avenue, Suite 1006 Seattle, WA 992028104
Construction Contractor	Matt Hall	S.A. Gonzales	5516 N Starr Road Newman Lake, WA 99025

Appendix A- As-Builts



SITE LOCATION

NOTES:
AS-BUILT SURVEY WAS PERFORMED BY h2 ENGINEERING & SURVEYING, LLC ON SEPTEMBER 25, 2007.

THE HORIZONTAL CONTROL IS BASED ON WASHINGTON NORTH ZONE, NAD 1983/91 STATE PLANE COORDINATES. AND THE VERTICAL CONTROL IS NAVD 88 ORTHOMETRIC HEIGHTS.

ADDITIONAL SITE FEATURES WERE FIELD LOCATED BY DEPARTMENT OF ECOLOGY STAFF ON DECEMBER 20, 2007 AND March 17, 2008.

REV.	DATE	DESCRIPTION	DES BY	DWN BY	CHK BY	APP BY
1	12/21/2007	AS-BUILT REVISIONS	CHW	HGD	SWF	SWF
2	01/18/08	MINOR REVISIONS	CHW	SHC	SWF	CHM
3	03/28/08	ADDITION OF TRAIL MARKER BOULDERS AND SIGNS	CHW	SHC	SWF	CHM

RIDOLFI Inc.

WASHINGTON STATE DEPARTMENT OF ECOLOGY

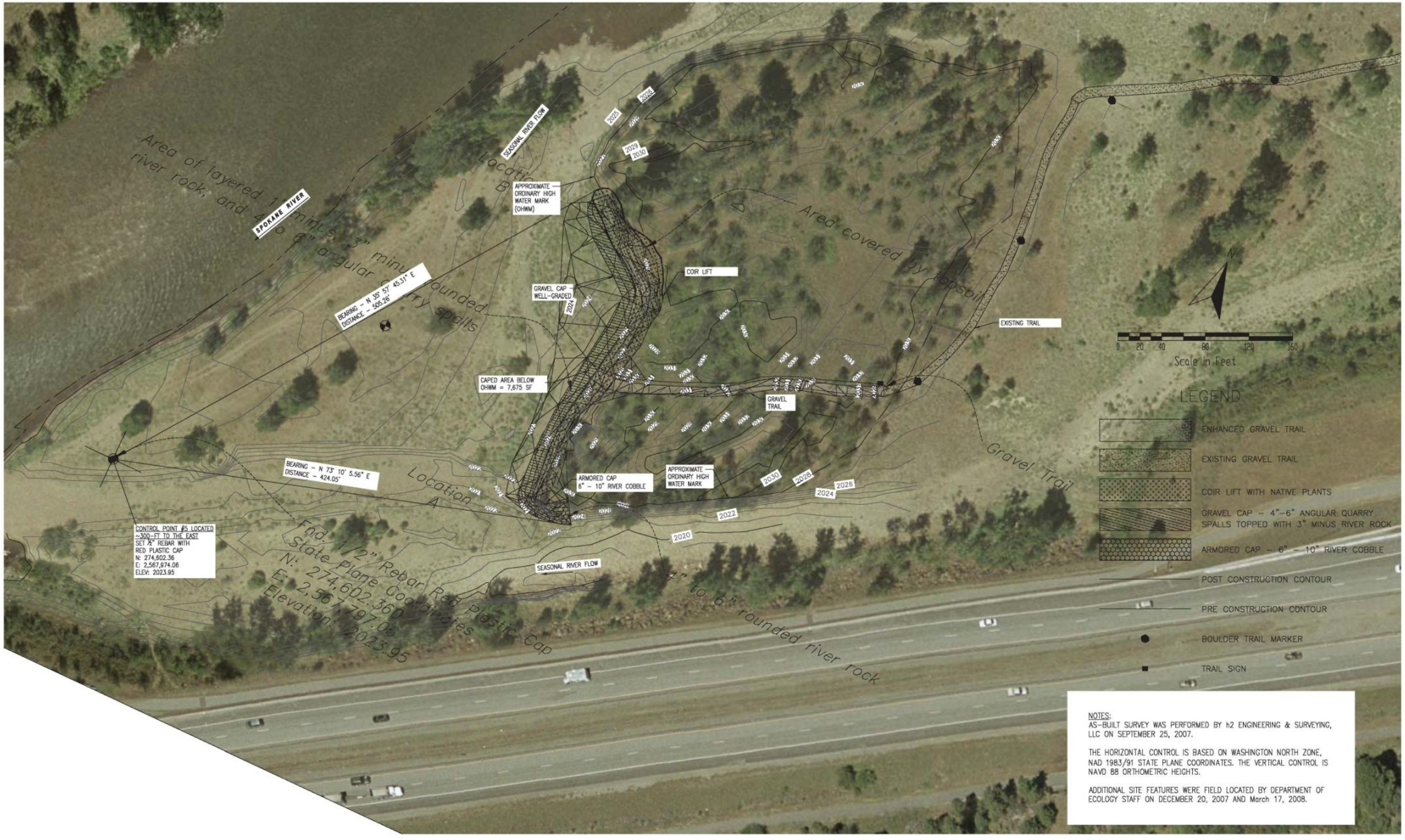
Date Of Issue:	APRIL 2008
Designed By:	CHM
Drawn By:	SHC
Checked By:	SWF
Approved By:	CHM

SPOKANE RIVER METALS SITES
ISLAND COMPLEX RECREATIONAL AREA
REMEDIAL ACTION
SPOKANE COUNTY, WASHINGTON

ISLAND COMPLEX RECREATIONAL AREA
AS-BUILT

Drawing No.
–

Project No.
501C



Reference: Aerial photo courtesy of Avista. GeoEngineers added the aerial photo to the surveyors contour map.

GEOENGINEERS

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. This figure was originally produced in color.

Island Complex
Remedial Action As-Built

Spokane River Metals Sites
Spokane County, Washington

XXX : XXX

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Starr Road Remedial Action Report

3. Starr Road Remedial Action Report

3.1. Background

The Starr Road Recreation Area is located on the northern shoreline of the Spokane River, approximately 2.5 miles west of the Washington and Idaho state line. The Starr Road site is located on approximately 85-acres of land owned and operated by the Washington State Parks and Recreation Commission (Spokane County Parcel numbers 55024.0701 and 55012.0122). The seasonally submerged areas of the Starr Road area on the Spokane River are controlled by the Washington State Department of Natural Resources. The contaminants present at Starr Road are associated with historic mining operations in the Coeur d'Alene Basin. The metals of principal concern for protection of human health are lead and arsenic. The project goal was to reduce the risk of human exposure to identified contaminants of concern (COCs), specifically lead and arsenic, in accordance with the Record of Decision (ROD) for the Bunker Hill Mining and Metallurgical Complex, Operable Unit 3 (the Bunker Hill OU3 ROD).

Key elements of the Remedial Action at Starr Road were as follows:

- Excavation of 2,392 tons (approximately 1,600 cubic yards) metals-contaminated soils and sediment from approximately 1.05 acres of the gravel bar (seasonally exposed during the summer's dam-controlled low water event). The contaminated soil excavated from the bar was hauled to and disposed of at the Waste Management Inc., Graham Road Landfill in Medical Lake, Washington.
- Fill and regrading of the excavation in the Spokane River with an equivalent quantity of clean, similarly graded gravels. The fill consisted of two gravel gradations selected for restoration of rainbow trout spawning habitat disturbed by the excavation work.
- Placement of 4,842 tons of upland fill (approximately 3,000 cubic yards) over a 1.95-acre nearshore area to create a barrier-type soil cap over contaminated sediment and soils that were not spawning habitat. Approximately 0.90 acres of the cap are located below the ordinary high water (OHW) elevation; 1.05 acres of the cap are above the OHW elevation.
- Placement of 2,917 tons (approximately 1,500 cubic yards) of topsoil for re-vegetation of cap areas, paths and trails, and abandoned roads located above the OHW elevation.

The remedial action design was completed in general accordance with the requirements of the ROD.

3.2. Construction Activities

Construction Supervision and Administration

The U.S. Army Corps of Engineers (USACE) began providing supervision and administration services to EPA for the Starr Road Site in January 2006. Supervision and administration activities performed by USACE included:

- Contracting actions
- Pre-construction coordination with the selected Contractor

- Field oversight of construction activities and the Contractor's systems for quality control, environmental protection and regulatory requirements, and health and safety
- Administration and cost accounting for the construction contract

Bidding/Contractor Selection

Construction services were solicited using USACE's Multiple Award Remediation Contract (MARC) on January 13, 2006. The contract was awarded to Bay West, Inc. on February 22, 2006, and a notice-to proceed was issued on March 23, 2006.

Mobilization and Site Preparation

A trailer was mobilized to the site for use as the field office during work on the Starr Road project. Improvements to the site access road were completed in order to provide safe conditions for hauling of equipment, materials, and waste from the project. Access to work areas was restricted through the installation of high visibility construction fence across previous footpaths. Signs were also posted to identify restricted work areas and provide notification that hard hats were to be worn within restricted work areas. Sediment prevention and erosion control best management practices (BMPs) were implemented in accordance with the Environmental Protection Plan prior to the start of any excavation activities. An initial survey was performed to layout work areas and document preexisting elevations within the excavation area.

Soil Excavation and Cap Construction

Sediments impacted by heavy metals were excavated from the gravel bar in the Spokane River to a depth of 1 foot and capped with clean fill material to the former grade. Excavation was performed in a manner to limit spills and prevent cross contamination of clean areas. Excavated materials were stockpiled in day piles prior to transportation from the site. Stockpiled material was located within the designated excavation/capping areas to prevent cross contamination of non-impacted soils.

Based on sampling results documented by USACE in the Washington Recreational Sites, Starr Road and Island Complex Field Sampling Report, dated January 7, 2005 the excavated soils were already characterized and profiled for disposal as a non-hazardous waste at Waste Management's Graham Road Recycling and Disposal Facility in Medical Lake, WA. The disposal site was determined by EPA Region 10 to be in compliance with the CERCLA off-site policy. All waste from the site was transported in construction dump trucks with sealed end gates and covers. Waste was tracked using waste profiles and load tickets. All loads were weighed at the disposal facility. Copies of all weight tickets were retained for waste tracking and payment.

Four types of fill material were imported to the work site for backfill and cap construction. These materials included:

- Gravel Bar Fill Type A
- Gravel Bar Fill Type B
- Upland Fill

- Topsoil

Fill materials were placed in the locations and at depths identified in the contract plans. In general, upland fill was used to place a 1-foot cap over impacted soils that were below the ordinary high water elevation. Cap areas above the ordinary high water elevation received 8 inches of upland fill covered by 4 inches of topsoil. The topsoil was seeded and mulched in accordance with contract specifications. Excavated areas along the gravel bar were backfilled with either Gravel Bar Fill Type A or Gravel Bar Fill Type B. The Type B fill is a larger aggregate similar in size to material found in high water velocity regions along the gravel bar. Gravel Bar fill was placed to match existing conditions as shown on contract plans. A total of 2,310.11 tons of Gravel Bar Fill Type A and 289.06 tons of Gravel Bar Fill Type B were placed in the excavation areas. A total of 4,842.11 tons of upland fill was used in the cap construction along with a total of 2,197 tons of topsoil (this total includes the pathways that were covered with 6 inches of topsoil and re-vegetated).

Construction of Turnout Area and Permanent Access Pathways

Based on a request from the State, a new asphalt turnout was constructed to allow cars to park along River Road. While beyond the scope of the EPA Remedial Action as specified by the Coeur d'Alene ROD, EPA proceeded with work using their Remedial Action contractor with the anticipation that the State would reimburse costs for work not related to the ROD remedy and with the understanding that the asphalt turn out would provide an engineering control and regulate access to the site, thus provding protection for the capped upland areas. Since the completion of the Starr Road project, EPA and the State have reached agreement on reimbursement for this non CERCLA work.

The turnout area was initially cleared and grubbed to remove existing vegetation and debris. Existing asphalt was removed and a determination was made to not disturb the road-base due to an optic cable that was already in place. Filter fabric was place and sub-base gravel was placed over filter fabric and compacted to a thickness of at least 12 inches. The sub-base gravel was then topped with 6 inches of crushed surfacing base course and 2 inches of asphalt.

From the turnout area a permanent access pathway, compliant with the Americans with Disabilities Act of 1990 (ADA) was constructed to provide public access to the Spokane River. Along the pathway existing vegetation was cleared and grubbed. The existing surface was shaped to provide a level surface for a pathway. A 6-inch compacted layer of crushed gravel was placed and compacted over a layer of filter fabric. A total of 1,133.20 tons of crushed gravel was used to construct the turnout and access pathway. Filter fabric, crushed gravel, and 317.55 tons of riprap was then used to protect steep edges of the pathway from erosion. It was determined that crushed gravel would provide a better riprap bedding layer than sand since sand would likely roll and/or wash off the filter fabric on the sloped surfaces. USACE approved of the substitution of crushed gravel for sand as the bedding layer for riprap.

Material imported for the construction of the turnout area and access pathways included:

- Base Course
- Sub-base Gravel

- Class II Riprap
- Crush Gravel

Re-vegetation of Footpaths and Roads

A number of pre-existing pathways and roads were designated for closure through placement of boulder barricades and establishment of new vegetation. The top 6 inches of existing soil was mechanically scarified and then covered with 6 inches of imported topsoil. Grass seed was planted to establish native grasses. Boulders were relocated from along River Road and placed at the entrances to the restored former pathways or roads to prevent disturbance of these areas before the grass seed was established.

Planting of Hostile Vegetation

In order to discourage public access to the river bank, hostile vegetation (e.g., Wild Roses, Snowberry, Golden Currants, and Black Hawthorns) was planted at random in two bedding areas under guidance provided by Washington Department of Ecology. Project plans depicted neat rows of vegetation with plantings 4 feet on-center. Existing vegetation prevented planting in neat rows. Random planting within the bedding areas in and around existing vegetation will produce a natural appearance while discouraging access.

Health and Safety

Project activities were completed in accordance with health and safety requirements contained in the Site Safety and Health Plan (SSHP). The SSHP incorporated applicable requirements from the following publications:

- 29 Code of Federal Regulations (CFR) 1910 and 1926 Occupational Safety and Health Standards
- Washington Administrative Code (WAC) 296-24 General Safety and Health Standards
- WAC 296-62 General Occupational Health Standards
- WAC 296-155 Safety Standards for Construction Work
- Engineering Manual (EM) 385-1-1 Safety and Health Requirements Manual
- Engineering Regulations (ER) 385-1-92 Safety and Health Elements for HTRW Documents

Employee compliance with safe work practices and rules was determined through observation by managers and fellow employees, review/evaluation of required paperwork submittals, accident investigation, and drug and alcohol testing. There were not any accidents, incidents, near misses, or unusual events during services performed at the Starr Road site.

Decontamination procedures were tailored to the specific hazards of the site and operations being performed. During personnel decontamination, disposable, contaminated PPE or other articles were collected for disposal with impacted soil from the site. All personnel washed exposed skin, including face and hands, with soap and water. Contaminated equipment was decontaminated by removing gross contamination and washing the equipment until clean with a detergent/water solution. All liquid decontamination wastes were used as dust control in loads of contaminated soils.

An initial Lead exposure assessment did not indicate exposure over the OSHA employee action level for lead of 30 Mg/m3. Based on these results, medical monitoring for blood lead and zinc protoporphyrinlevels (ZPP) was not required to be initiated in accordance with the OSHA Lead standard in 29 CFR1926.62. An initial employee exposure assessment was used to document exposure levels. Lead and arsenic were monitored using a calibrated sample pump, an MCE filter, and an AIHA accredited analytical laboratory. Personal breathing zone samples were analyzed using NIOSH Method 7300. Full shift personal breathing zone samples were be obtained on the first two days of intrusive work activities. Level C PPE was maintained until the analytical results of the initial assessment were reviewed by the supervising certified industrial hygienist (CIH). Table 3-1 shows the results of the initial assessment. Real-time dust monitoring with a miniRAM was performed throughout excavation and loading operations. Results of the monitoring showed that lead and arsenic concentrations never exceeded the project action levels.

Table 3-1. Initial Exposure Monitoring Results

	Lead	Arsenic
OSHA PEL	50 $\mu g/m^3$	10 $\mu g/m^3$
Project Action Level	30 $\mu g/m^3$	2 $\mu g/m^3$
8/14/06	< 1.2 $\mu g/m^3$	< 1.2 $\mu g/m^3$
8/15/06	< 1.0 $\mu g/m^3$	< 1.0 $\mu g/m^3$

3.3. Chronology of Events

The chronology of site activities is described in Table 3-2.

Table 3-2. Chronology of Events

Date	Activities
January 13, 2006	The project request for proposal was issued to the three MARC contractors for bidding.
February 6, 2006	Contractor bids were received.
February 22, 2006	Contract awarded to Bay West, Inc.
March, 23, 2006	Notice-to proceed issued.
April 11, 2006	Pre-construction meeting
August 7, 2006	Field construction season for remediation of the Starr Road site began with mobilization to the site.
August 24, 2006	Construction activities in the nearshore portions of the river were substantially completed.
September 20, 2006	Upland work for the remainder of the site was completed.
October 3, 2006	Contractor completed demobilization from the site.
April 6, 2007	Final closeout documentation and invoicing was completed.

3.4. Performance Standards and Construction Quality Control

Cap Construction Gradation Testing

Gradation testing was completed on all fill materials used during the cap construction. The following tables show the results of the testing:

Table 3-3. Results of Gradation Analysis of Gravel Bar Fill Type A

Sieve Size (mm)	Specification (%)	Sample ID/Percent Passing							
		S219	S225	S230	S231	S232	S235	S236	S239
75.0 mm (3")	100	100	100	100	100	100	100	100	100
50.0 mm (2")	85 to 100	100	100	100	100	100	100	100	100
25.0 mm (1")	65 to 95	82	87	76	80	87	88	87	85
12.5 mm (1/2")	50 to 85	57	61	52	54	58	59	57	54
4.75 mm (No.4)	30 to 60	49	54	48	51	53	55	53	49
2.00 mm (No. 10)	20 to 45	34	37	30	30	36	38	36	33
0.425 mm (No. 40)	5 to 15	6	6	6	6	7	7	7	6
0.075 mm (No. 200)	0 to 5	2.6	3.2	2.9	3.0	2.7	2.3	2.7	2.5

Table 3-4. Results of Gradation Analysis of Gravel Bar Fill Type A

Sieve Size (mm)	Specification (%)	Sample ID/Percent Passing
		S221
150 mm (6")	100	100
75.0 mm (3")	70 to 90	90
50.0 mm (2")	50 to 75	73
25.0 mm (1")	40 to 60	50
12.5 mm (1/2")	25 to 50	29
4.75 mm (No. 4)	15 to 35	18
0.075 mm (No. 200)	0 to 5	0.9

Table 3-5. Results of Gradation Analysis of Upland Fill (a)

Sieve Size (mm)	Specification (%)	Sample ID/Percent Passing						
		S214	S220	S222	S223	S224	S227	S228
75.0 mm (3")	60 to 100	93	93	96	95	97	89	86
50.0 mm (2")	45 to 80	82	79	88	85	85	79	74
25.0 mm (1")	30 to 65	70	60	73	66	62	65	57
12.5 mm (1/2")	25 to 50	45	36	47	51	38	43	37
4.75 mm (No. 4)	15 to 35	22	21	25	39	22	27	22
2.00 mm (No. 10)	10 to 25	16.7	17	19	30	18	21	14
0.425 mm (No. 40)	0 to 10	2	3	3	4	4	3	3
0.075 mm (No. 200)	0 to 5	0.1	0.7	1.1	1.2	1.3	0.7	1.6

Table 3-6. Results of Gradation Analysis of Upland Fill (b)

Sieve Size (mm)	Specification (%)	Sample ID/Percent Passing						
		S229	S233	S234	S240	S241	S243	S244
75.0 mm (3")	60 to 100	92	95	94	94	94	97	94
50.0 mm (2")	45 to 80	79	82	80	83	78	77	86
25.0 mm (1")	30 to 65	63	59	61	69	59	46	69
12.5 mm (1/2")	25 to 50	43	34	39	51	42	28	46
4.75 mm (No. 4)	15 to 35	27	18	22	33	28	18	29
2.00 mm (No. 10)	10 to 25	19	11	16	24	19	9	21
0.425 mm (No. 40)	0 to 10	3	2	3	4	3	2	4
0.075 mm (No. 200)	0 to 5	1.6	0.9	1.1	1.6	1.4	0.9	1.5

Due to the samples containing large size rocks, accurate sieve analysis was difficult. In order to account for these difficulties, a large sample size (150 lbs) was used. However, a small variation in the number of large rocks contained in a sample still made a significant difference on the % passing ratios. A single 5-lb rock in a sample represents 3% of the total weight in a 150-lb sample. Adding to the analysis difficulty was that most of the gradation samples were taken from the bottoms of stockpiles. Larger rocks tended to roll down the side of a stockpile thereby increasing the number of large rocks

in samples. On an average, the upland fill was within gradation requirements with the exception of the 2” sieve size. The average gradation at the 2” sieve size was 81% vs 80% specified. This is a minor variation that is most likely due to segregation of large rocks in the stockpiles.

Table 3-7. Results of Gradation Analysis of Topsoil

Sieve Size (mm)	Specification (%)	Sample ID/Percent Passing				
		S205	S206	S207	S208	S209
12.5 mm (1/2”)	90 min	100	100	100	99	100

Turnout Area and Permanent Access Pathway Dimensions and Fill Gradation

The dimensions of the turnout and access pathways deviated from plans and specifications for this project. These adjustments were made with concurrence from USACE prior to any construction activities. The reasoning for the adjustments was to accommodate existing road guard railing and to maintain a pathway slope within ADA compliance.

Table 3-8. Results of Turnout Lane Density Testing

1st Lift	1nd Lift	2rd Lift	3th Lift	4th Lift	4th Lift	5th Lift	5th Lift	6th Lift
96%	96%	97%	96%	95%	93%	95%	97%	96%
6th Lift	7th Lift	8th Lift	8th Lift	9th Lift	10th Lift	Top of Subbase	Base Grade	Base Grade
95%	98%	95%	95%	95%	95%	95%	96%	96%

Table 3-9. Results of Access Ramp Density Testing

Access Ramp Density Testing	
1st Test	2nd Test
95%	95%

Gradation testing was completed on all fill materials used during the construction of the turnout area and permanent access pathway. The following tables show the results of the testing.

Table 3-10. Results of Gradation Analysis of Base Course

Sieve Size (mm)	Specification (%)	Sample ID/Percent Passing
		S213
31.75 mm (1-1/4")	100	100
25.0 mm (1")	80 to 100	97
15.875 mm (5/8")	50 to 80	59
4.75 mm (No. 4)	25 to 45	29
0.425 mm (No. 40)	3 to 18	9
0.075 mm (No. 200)	7.5 max	4.7

Table 3-11. Results of Gradation Analysis of Sub-base Gravel

Sieve Size (mm)	Specification (%)	Sample ID/Percent Passing
		S237
50.0 mm (2")	75 to100	100
4.75 mm (No. 4)	22 to 100	41
0.075 mm (No. 200)	10 max	6.6

Table 3-12. Results of Gradation Analysis of Class II Riprap

Criteria	Specification (%)	Results
Smaller than 500#	100 max	88
At 200#	50 min	69

Table 3-13. Results of Gradation Analysis of Crushed Gravel for Pathway

Sieve Size (mm)	Specification (%)	Sample ID/Percent Passing
		S210
19.0 mm (3/4")		100
12.5 mm (1/2")		92
9.5 mm (3/8")	100	76
4.75 mm (No. 4)	46 to 66	45
0.425 mm (No. 40)	8 to 24	15
0.075 mm (No. 200)	10 max	9.5

The material used for the pathway contained 8% in the 1/2"- 3/4" range and 16% in the 3/8"-1/2" range. This minor variation from specified gradation was accepted by USACE.

Fill Material Sampling and Analysis

All fill materials were sampled as they were delivered to the project site. A composite sample was collected for every 200 cubic yards (cy) of fill type delivered. For each 200 cy of fill material individual aliquots from each truckload were obtained and composited into a single soil sample. The samples were collected and analyzed at Severn Trent Laboratories, Inc. in Tacoma, Washington to certify that the levels for lead, arsenic and cadmium were below action levels and the imported fill materials were not a hazard to the Spokane River and the public. Results indicated that none of the fill material exceeded project limits for lead, arsenic, or cadmium.

Turbidity Testing and Results

Turbidity testing of the Spokane River water was conducted in accordance with the technical specification. During soil excavation and cap construction turbidity was monitored at three locations twice a day. The locations were selected upgradient, adjacent and downgradient from the active work areas. Turbidity was determined using a YSI 6820 Sonde with a 650 MDS display/logger. Variance of turbidity between sample locations was limited to less than 10 nephelometric turbidity units (NTUs). Turbidity was not to exceed background turbidity by more than 50 NTUs at an instantaneous sampling event or more than 25 NTUs for more than 10 consecutive days.

The instrument was calibrated in the field prior to use for every day it was required. Turbidity never exceeded 1.9 NTUs and variance of turbidity never exceeded 1.5 NTUs; the technical specifications were met.

3.5. Final Inspection and Certifications

USACE field personnel were on site during all phases of construction activities and accepted the work completed at the site on October 5, 2006. Project activities were completed in general accordance with health and safety requirements contained in the specifications. Bay West, Inc. complied with the SSHP; there were no substantial problems or deviations.

3.6. Operations and Maintenance Activities

A formal monitoring plan was finalized by Ecology in September 2013. Monitoring activities include field observations to assess cap integrity, sediment deposition patterns, and health of introduced vegetation. The plan also requires discrete sampling of surficial material (i.e., deposited on the top of the surface layer of the cap) and of sub-cobble layer material (i.e., deposited sediment not to include any of the cap material). If suitable amounts of material are not present, then a sample is not taken and it is noted in the field book. Sediment/soil samples will be analyzed for arsenic, cadmium, lead, and zinc. Monitoring activities will occur every five years (starting in 2013) or during a year in which a 40,000 cubic foot per second flow event occurs in the Spokane River.

3.7. Contact Information

Table 3-14 provides contact information for the major design and remediation contractors and the state oversight lead.

Table 3-14. Contact Information

Project Role	Name	Organization	Address
EPA RPM	Ravi Sanga	EPA	1200 6th Avenue Seattle, WA 98101
Project Manager	Bradley Kulberg	Bay West, Inc.	5 Empire Drive St. Paul, MN 55103
USACE Project Manager	Harald Ehlers	USACE	4735 East Marginal Way South Seattle, WA 98134

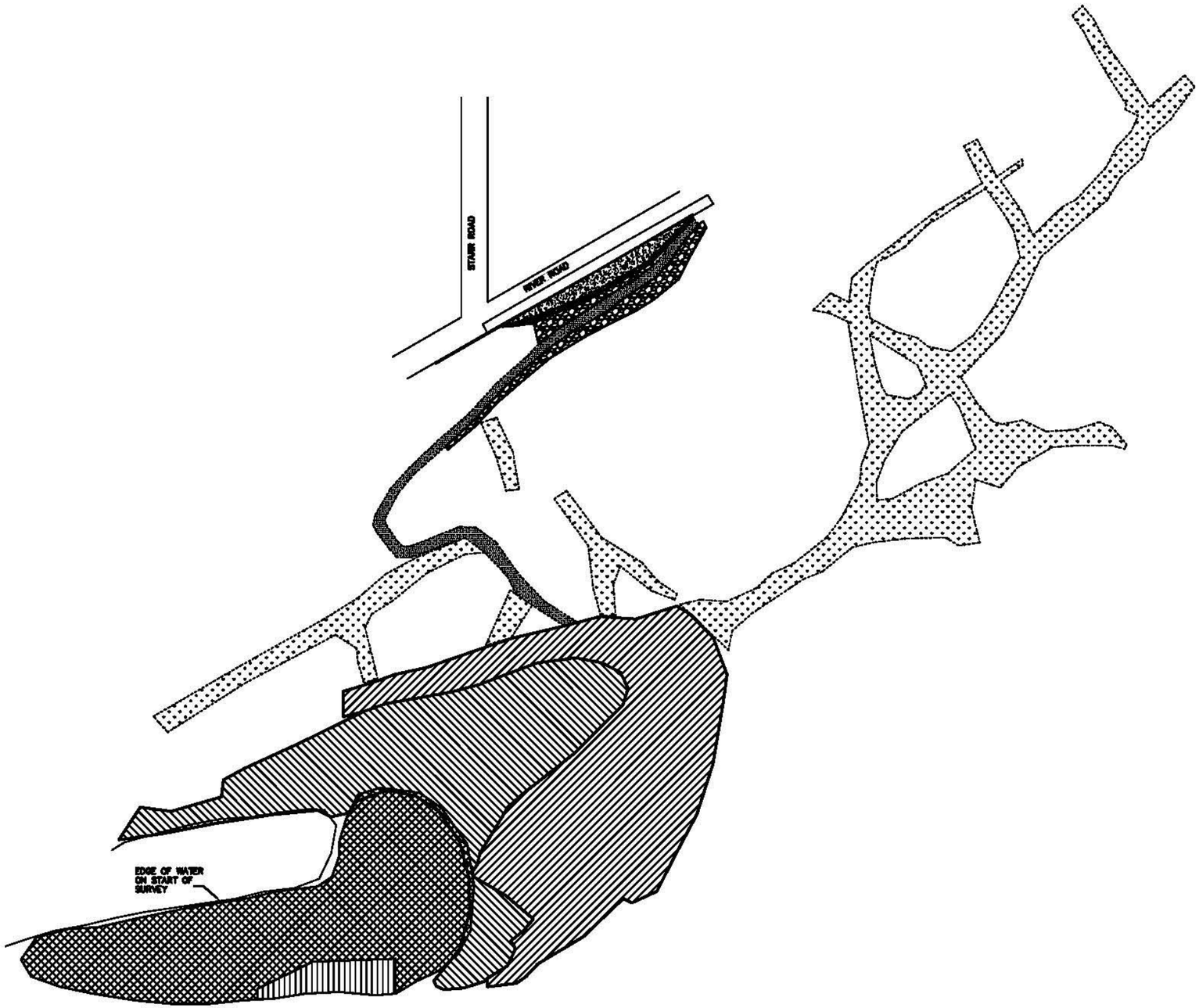
Appendix A- As-Builts

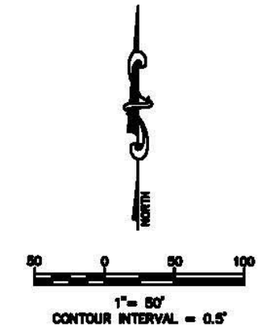
ELEVATION DATUM

THE ELEVATIONS SHOWN HEREON ARE ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 BASED ON USING AN ELEVATION OF 3000.49 FEET AT CONTROL POINT 7 AS SHOWN ON PLAN SHEET 03 OF US ARMY CORPS OF ENGINEERS STAR ROAD PROJECT FILE NUMBER E-21-1-9.

ASBUILT SITE SURVEY

FOR TOTAL AREAS
STAR ROAD PROJECT, SPOKANE COUNTY, WASHINGTON
U.S. ARMY CORPS OF ENGINEERS, SEATTLE DISTRICT, FILE NO. E-21-1-9





LEGEND/AREAS

- ASBUILT RE-VEGETATED FOOT PATHS AND BERMS TOTAL AREA = 46,288 SQ. FT.
- ASBUILT ASPHALT PAVEMENT TOTAL AREA = 2317 SQ. FT.
- ASBUILT ACCESS PATHWAY AND RAMP TOTAL AREA = 3978 SQ. FT.
- ASBUILT CLASS II RIP RAP TOTAL AREA = 4143 SQ. FT.
- ASBUILT CAP RIVERM TYPE A TOTAL AREA = 38890 SQ. FT.
- ASBUILT CAP RIVERM TYPE B TOTAL AREA = 48880 SQ. FT.
- ASBUILT GRAVEL BAR TYPE A = 42234 SQ. FT.
- ASBUILT GRAVEL BAR TYPE B = 3280 SQ. FT.
- ASBUILT BREAKLINE = 494 SQ. FT.

SURVEYOR'S CERTIFICATE

I, DUSTY B. OBERMAYER, PROFESSIONAL LAND SURVEYOR No. 11119 IN THE STATE OF IDAHO, DO HEREBY CERTIFY THAT THIS SURVEY WAS MADE BY ME OR UNDER MY SUPERVISION FOR INTRESS, INC.

Dusty B. Obermayer

DUSTY B. OBERMAYER PLS 11119 11-13-08

PROFESSIONAL LAND SURVEYOR REGISTERED 11119 STATE OF IDAHO DUSTY B. OBERMAYER

SCALE: 1" = 50' DATE: OCT. 13, 2008 SHEET 1 OF 11	CREW: DBO; DEB DRAWN BY: DBO APPROVED BY: DBO	PROJECT #: SW00075 DWG: SW00075 FINAL REV:	MECKEL ENGINEERING & SURVEYING [illegible]

ASBUILT SITE SURVEY
STAR ROAD PROJECT, SPOKANE COUNTY, WASHINGTON
U.S. ARMY CORPS OF ENGINEERS, SEATTLE DISTRICT, FILE NO. E-21-1-9

Murray Road Remedial Action Report

4. Murray Road Remedial Action Report

4.1. Background

The Murray Road Site is located on the north side of the Spokane River, about two miles downstream from the Idaho-Washington border (approximately river mile 94.3).

The Remedial Action at Murray Road consisted of placement of capping materials at four locations within the project site. Key elements of the remedial design included:

- Placement of a cap ranging in thickness from 12 – 18 inches as follows:
    - Cap A consisted of spawning mix only and is approximately 26,000 square feet
    - Cap B consisted of a gravel mix with soil added at the surface which was then hydroseeded and is approximately 43,100 square feet
    - Cap C consisted of a gravel mix with soil added at the surface which was then hydroseeded and is approximately 50,000 square feet
    - Cap D consisted of a sand mix and is approximately 4,200 square feet
- Placement of crushed gravel on the trail and in the parking area

The remedial action design was completed in general accordance with the requirements of the ROD.

4.2. Construction Activities

Pre-construction Sampling

In 2006, twelve samples were collected within the site boundaries to further explore and characterize sediment contamination. Nine samples exceeded the EPA cleanup level of 20 mg/kg for arsenic and four samples exceeded the EPA ROD cleanup level for lead (700 mg/kg).

Bidding/Contractor Selection

Ecology bid the project in 2007. The construction contract was awarded to Ridolfi Inc., who implemented the remedial action.

Health and Safety

Project activities were completed in accordance with health and safety requirements contained in the contract specifications, which required use of HAZWOPER-trained staff. Contractors prepared and implemented their own health and safety plans.

Site Access

Access to the site involved traveling south along a gravel trail through Washington State parks property from a gravel parking area adjacent to the intersection of River Road and Murray Road.

Erosion and Sediment Control

Fiber wattles were installed along the river's edge to provide erosion control.

Cap Area

The cap area was delineated by the Ecology field representative. Minor adjustments relative to the cap design limits were made based on field conditions encountered. The contractor's surveyor maintained vertical and horizontal control over the cap area throughout construction.

Archeological observation

Plateau Archaeological Investigations, LLC (Plateau) provided archeological observation during activities on site. No Native American or historic-era cultural materials or features were observed during the monitoring.

Cap Material

Capping materials were delivered and stockpiled in the Murray Road staging area between August 30, 2007 and September 12, 2007. Import material was visually inspected and approved by Ecology's field personnel prior to placement.

Capping Material Placement

The project design specified varying cap thicknesses to be place throughout the site ranging from between 12 and 18 inches. Capping activities occurred at four locations within the project site: Cap A, Cap B, Cap C, and Cap D. Cap A consisted of spawning mix only and is approximately 26,000 square feet. Cap B and Cap C consisted of a gravel mix with soil added at the surface which was then hydroseeded; Caps B and C are approximately 43,100 and 50,000 square feet, respectively. Cap D consisted of a sand mix and is approximately 4,200 square feet.

Survey

Following the placement of capping material, a final survey was completed to verify horizontal and vertical design limits. Survey results indicated the final thickness and capping area were in accordance with the project design plans and specifications.

Post-construction Sampling

After construction, six shallow samples (approximately 3 inches below ground surface) were collected within the project site on September 16, 2008 to document a baseline for performance monitoring. One sample exceeded the EPA screening criteria for arsenic (20 mg/kg). A follow-up sampling effort was conducted on November 17, 2008, where three samples were collected, one from the same location of the exceedence and two others nearby. None of the three samples exceeded the EPA screening criteria for arsenic.

4.3. Chronology of Events

The chronology of site activities is described inTable 4-1.

Table 4-1. Chronology of Events

Date	Activities
2006	Pre-construction sampling: twelve samples were collected within the site boundaries to further explore and characterize sediment contamination.
2007	Ecology bid the project. Contract was awarded.
August 21, 2007	Construction staking for capping area completed. Small field adjustments were made by Ecology personnel.
August 27, 2007	Access route was rolled smooth, boulders blocking access were moved, and a chain was installed.
August 28, 2007	Pre-project walkthrough.
August 29, 2007	Large rocks were removed from Cap A and Cap B areas. Fiber wattles were installed along the river's edge to provide erosion control. Approximately 24 truckloads of Cap A material was delivered to the site in belly dump trucks. Cap A material was spread with a bulldozer starting at the downstream end of the site.
August 30, 2007	Approximately 25 truckloads of Cap A and 9 truckloads of Cap B material were delivered to the site. Cap A was completed. Placement of Cap B material began from the downstream end of the site. Vegetation removal by chainsaw began. Cut vegetation remained on site.
September 4, 2007	Approximately 38 truckloads of Cap B and Cap C upland mix material were delivered. Cap B work continued from west to east.
September 5, 2007	Approximately 40 truckloads of Cap B and Cap C upland mix material were delivered. Approximate finish grade (1-foot thickness) was achieved over the Cap B area just west of the vegetation. Cap B placement continued from west to east.
September 6, 2007	Approximately 50 truckloads of Cap B and Cap C upland mix material were delivered to the site. Cap B work continued from west to east using a thin layer and setting grade from east to west.
September 7, 2007	Approximately 45 truckloads of Cap B and Cap C upland mix material were delivered to the site. Cap B work continued from west to east using a thin layer and setting grade from east to west.
September 10, 2007	Approximately 35 truckloads of Cap B and Cap C upland mix material were delivered to the site. Approximately 5 truckloads of Cap A spawning mix were delivered and placed to finish Cap A. Seven truckloads of topsoil were delivered and placed.
September 11, 2007	Approximately 5 truckloads of Cap B and Cap C upland mix material were delivered to the site. Approximately 52 truckloads of topsoil were delivered and placed, completing topsoil installation. Caps A, B, and C were substantially complete. Two truckloads of sand were delivered and placed on Cap D area.
September 12, 2007	Approximately 15 truckloads of 5/8-inch crushed rock were delivered and place along the 4-foot upper trail, 8-foot lower trail, and parking area. Cap D was substantially complete.
September 13, 2007	Boulders were rearranged and gravel was spread in the parking lot. Boulders were delivered to mark trail. Rocks removed from Cap A and Cap B areas were replaced. Parking lot and trail were hand rolled, topsoil was loosened for seeding, and vegetation damaged during construction was trimmed back.
September 20, 2007	Hydroseed was applied to the topsoil on cap, disturbed areas along the access trail, and old parking area.
September 2007	The contractor demobilized from the site.

Date	Activities
September 25, 2007	As-built survey was performed by H2 Engineering and Surveying, LLC.
September 16, 2008	Six shallow samples collected within the project site to document baseline for performance monitoring.
November 17, 2008	Three samples were collected in response to elevated arsenic concentrations in one sample from previous sampling event.

4.4. Performance Standards and Construction Quality Control

The construction of the remedial cap was completed in general accordance with the remedial design plans and specifications. Table 4-3 summarizes the remedial action performance metrics and field verification of design criteria and as-built conditions.

Table 4-2. Remedial Action Performance Metrics

Performance Metric	Remedial Design Criteria	Comment
Cap Area	Approximately 123,000 square feet	Final cap area measured by survey as 123,000 square feet (Appendix A).
Cap Thickness	12 to 18 inches	Confirmed by construction observation an as-built survey (Appendix A).
Cap Material Gradation	See Table 4-3	Confirmed by construction observation.
Vegetation Planting	Per design plans.	Confirmed by construction observation.

Table 4-3. Cap Design Gradations

Sieve Size	Percent passing (%)
Cap A Gravel Mix Design Gradation	
3 inch	100
2 inch	85-100
1 inch	60-95
½ inch	50-85
No. 4	30-60
No. 10	20-45
No. 40	5-15
No. 200	0-5
Cap B and Cap C Upland Mix Design Gradation	
3 inch	60-100
2 inch	45-80
1 inch	30-65
½ inch	25-50
No. 4	15-35
No. 10	10-25
No. 40	0-10
No. 200	0-5
Trail Cap D Sand Mix	
8 inch	100

Sieve Size	Percent passing (%)
4 inch	40-60
2 inch	10-25
½ inch	5 (max)
Trail Cap Gravel	
3/8 inch	100
No. 4	44-66
No. 40	8-24
No. 200	10 (max)

4.5. Final Inspection and Certifications

Ecology field personnel were on site during all phases of construction activities and accepted the work completed at the site in September 2007. There were no substantial problems or deviations.

4.6. Operations and Maintenance Activities

A formal monitoring plan was finalized by Ecology in September 2013. Monitoring activities include field observations to assess cap integrity, sediment deposition patterns, and health of introduced vegetation. The plan also requires discrete sampling of surficial material (i.e., deposited on the top of the surface layer of the cap) and of sub-cobble layer material (i.e., deposited sediment not to include any of the cap material). If suitable amounts of material are not present, then a sample is not taken and it is noted in the field book. Sediment/soil samples will be analyzed for arsenic, cadmium, lead, and zinc. Monitoring activities will occur every five years (starting in 2013) or during a year in which a 40,000 cubic foot per second flow event occurs in the Spokane River.

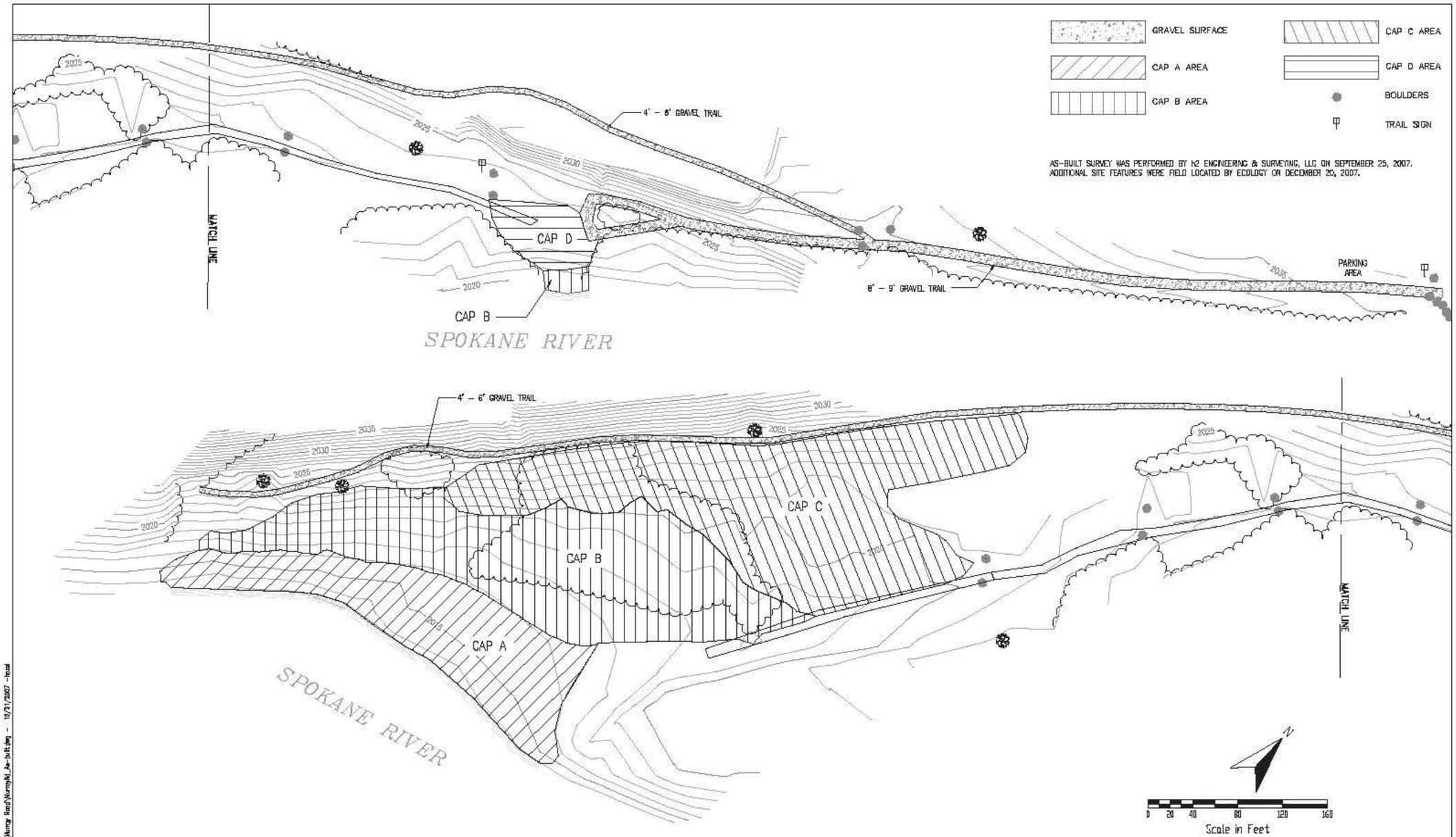
4.7. Contact Information

Table 4-4 provides contact information for the major design and remediation contractors and the state oversight lead.

Table 4-4. Contact Information

Project Role	Name	Organization	Address
Ecology Oversight	Zach Hedgpeth	Ecology	Eastern Region Office 4601 North Monroe Street Spokane, WA 99205
Project Engineer	Megan Hilgart	Ridolfi Inc.	1011 Western Avenue, Suite 1006 Seattle, WA 992028104
Construction Contractor	Matt Hall	S.A. Gonzales	5516 N Starr Road Newman Lake, WA 99025

Appendix A- As-Builts



REV.	DATE	DESCRIPTION	DES BY	DWN BY	CHK BY	APP BY
1	12/21/2007	As-built revision	HGD	HGD	SWF	SWF
–						
–						
–						

RIDOLFI Inc.

WASHINGTON STATE DEPARTMENT OF ECOLOGY

Date Of Issue:	December 2007
Designed By:	HGD
Drawn By:	HGD
Checked By:	SWF
Approved By:	SWF

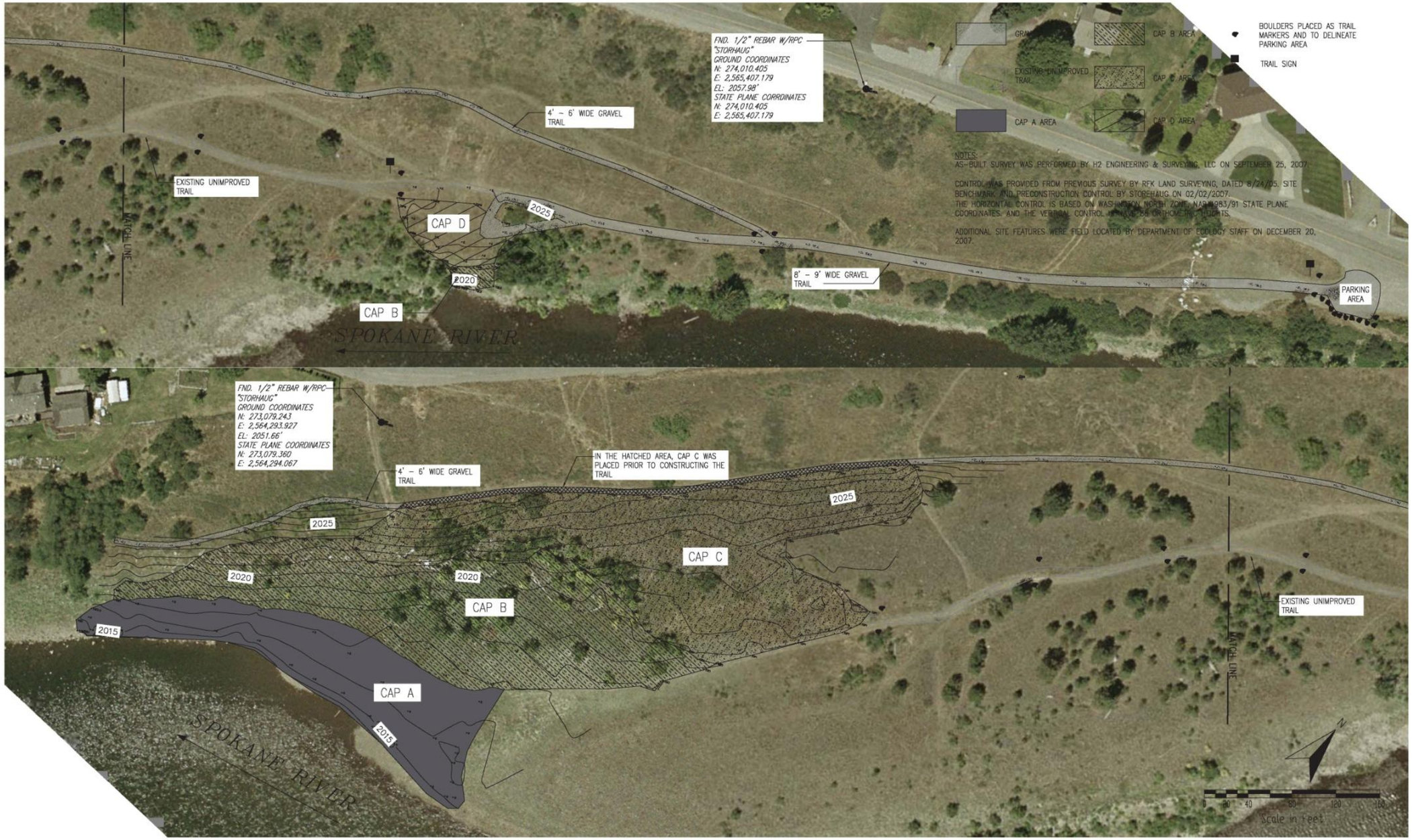
SPOKANE RIVER METALS SITES
MURRAY ROAD RECREATIONAL AREA
REMEDIAL ACTION
SPOKANE COUNTY, WASHINGTON

MURRAY ROAD RECREATIONAL AREA
AS-BUILT

Drawing No.

Project No.
501C

J:\2016 Ecology_Spokane_River\2007\Murray Road\Murray Rd_As-built.dwg – 12/21/2007 – hgd



Reference: Aerial photo courtesy of Avista. GeoEngineers added the aerial photo to the surveyors contour map.

GEOENGINEERS

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. This figure was originally produced in color.

Murray Road
Remedial Action As-Built

Spokane River Metals Sites
Spokane County, Washington

\\BOI\Projects\0\0504072_TEMP SPO\00\CAD\As-Builts\ASBUILTS 09-18-2013\MURRAY RDGE\-WIMG_MurrayRd_As-built.dwg\TAB.Layout1 modified on Oct 25, 2013 - 11:43AM X : XXX

Harvard Road Remedial Action Report

5. Harvard Road Remedial Action Report

5.1. Background

The Harvard Road site is located on Washington State Parks recreational land and Washington Department of Natural Resources aquatic lands, on the north side of the Spokane River, approximately river mile 94, adjacent to and west of Harvard Road. The Harvard Road site is recognized as a major spawning area for rainbow trout on the Spokane River. The purpose of the project was to remediate contaminated sediments used by rainbow trout for spawning and to protect the health of recreational users of the river by constructing a hydraulically-stable, engineered cap. The area around the nearby boat launch was included in the project boundaries; this area was modified to limit the use of boat trailers in areas where rainbow trout redds are likely to occur during spawning. The cap material specified spawning sized gravels in riverward portions of the site and included excavation of contaminated material to retain current river bed elevations thereby reducing the possibility that redds would be de-watered as river elevations decrease seasonally.

The Remedial Action at Harvard Road consisted of installation of an engineered, hydraulically stable cap. Key elements of the remedial design included:

- Excavation of 916 tons of contaminated sediments.
- Placement of capping materials in three areas as follows:
    - The first area was capped with approximately 12 inches of rounded gravel spawning mix over approximately 23,000 square feet along the river bank.
    - The second area was capped with approximately 6 inches of 5/8-inch crushed gravel over approximately 16,600 square feet in the upslope parking area.
    - The third area (the boat launch) was capped with two types of material: approximately 2 inches of 5/8-inch crushed gravel was placed over approximately 500 square feet of the approach to the boat launch and a gravel spawning mix was placed over approximately 1,400 square feet of the boat launch area.

The remedial action design was completed in general accordance with the requirements of the ROD.

5.2. Construction Activities

Pre-construction Sampling

In 2005, seven samples were collected within the Project Site boundaries to assess sediment contamination. Sampling results indicated one of the samples was above the EPA cleanup level of 20 mg/kg.

As an addendum to the 2005 Sampling and Testing Report for Harvard Road North, an additional six samples were collected on December 12, 2006 to assist in remedial planning. Results from this sampling indicate that one sample exceeded the established EPA ROD cleanup level for lead (700 mg/kg); only one sample exceeded the EPA cleanup level for arsenic (20 mg/kg).

Bidding/Contractor Selection

Ecology bid the project in 2007. The construction contract was awarded to Ridolfi Inc., who implemented the remedial action.

Health and Safety

Project activities were completed in accordance with health and safety requirements contained in the contract specifications, which required use of HAZWOPER-trained staff. Contractors prepared and implemented their own health and safety plans.

Site Access

The site was accessed from the gravel parking area adjacent to Harvard Road on the north side of the river. The parking area was used for staging during excavation and cap material placement. All access and work was completed on Washington State Parks and Recreation land.

Erosion and Sediment Control

Prior to site disturbance, sediment control best management practices (BMPs) were installed around the construction workspace (including within the river) to contain sediment and spoils. The contractor installed and maintained appropriate sediment control devices throughout the site in accordance with the applicable local, state, and federal regulations.

Archaeological observation

Plateau Archaeological Investigations, LLC (Plateau) provided archeological observation during all excavation activity on site. No Native American or historic-era cultural materials or features were observed during the monitoring.

Excavation and Disposal

The Harvard Road site was excavated to a depth of approximately 12-inches. Nine hundred and sixteen tons of waste material were removed and transported off site for disposal at Waste Management's, RCRA Subtitle D, Graham Road landfill located in Medical Lake, Washington.

Post-Excavation Sampling

After excavation, seven samples were collected at approximately 12 inches below ground surface to document metals concentrations of material remaining in-place beneath the cap. Post-excavation results indicate one sample exceeded the established EPA ROD cleanup level for lead (700 mg/kg); none of the samples exceeded the EPA cleanup level for arsenic (20 mg/kg). The area represented by the sample that exceeded the cleanup level for lead was addressed by the cap, which was described in subsequent sections. No further excavation was performed as a result of this single soil exceedence for lead.

Cap Material

The rounded spawning mix and 5/8-inch materials were delivered between August 26, 2007 and August 29, 2007. Based on review of field reports prepared at the time of construction, Ecology personnel visually observed and approved imported material.

Capping Material Placement

The project design included capping material placement in three areas encompassing approximately 41,000 square feet. The first area was capped with approximately 12 inches of rounded gravel spawning mix over approximately 23,000 square feet along the river bank. The second area was capped with approximately 6 inches of 5/8-inch crushed gravel over approximately 16,600 square feet in the upslope parking area. The third area (the boat launch) was capped with two types of material: approximately 2 inches of 5/8-inch crushed gravel was placed over approximately 500 square feet of the approach to the boat launch and a gravel spawning mix was placed over approximately 1,400 square feet of the boat launch area.

Survey

Following the placement of capping material, a final survey was completed to document horizontal and vertical constructed limits.

5.3. Chronology of Events

Construction activities are summarized by daily activity in Table 5-1 below.

Table 5-1. Chronology of Events

Date	Activities
2005	Pre-construction sampling: seven samples were collected within the Project Site boundaries to assess sediment contamination.
December 12, 2006	As an addendum to the 2005 sampling event, an additional six samples were collected.
2007	Ecology bid the project. Contract was awarded.
August 18, 2007	The contractor, Able Cleanup Technologies (ACT) mobilized to the site. Construction staking was completed by Tate Engineering. Boulders were moved to delineate the new boat launch ramp area.
August 19, 2007	Excavation along the western upslope side of the river bank began. Material was transferred from the river bed to plastic-lined upland staging area, and finally into trucks for transport to the Graham Road Landfill. Eight truck trips (approximately 250 tons) of material were removed from the site.
August 20, 2007	Excavation continued and 10 truckloads (approximately 310 tons) of material were removed from the site.
August 21, 2007	Excavation completed. Ten truckloads (approximately 300 tons) of material were removed from the site. Seven post-excavation samples were obtained.
August 26, 2007	Final transport of excavated material completed. Twenty-four truckloads (approximately 670 tons) of spawning mix capping material was delivered and placed.

Date	Activities
August 28, 2007	Seven trucks of spawning mix and ten trucks of 5/8-inch crushed rock were delivered. The boat launch was constructed, rolled with a smooth drum vibratory roller and successfully test driven. All capping material was "back-bladed" to smooth out the surface. Began spreading an 8-inch lift of 5/8-inch crushed rock in the parking lot.
August 29, 2007	Completed spreading and compacting 5/8-inch crushed rock in the parking lot with the exception of the outer edge fencing areas.
September 2, 2007	Fencing materials were delivered and installation began.
September 2007	The contractor demobilized from the site.

5.4. Performance Standards and Construction Quality Control

The construction of the remedial cap was completed in general accordance with the remedial design plans and specifications. Table 5-2 summarizes the remedial action performance metrics and field verification of design criteria and as-built conditions.

Table 5-2. Remedial Action Performance Metrics

Performance Metric	Remedial Design Criteria	Comment
Cap Area	Approximately 44,000 square feet	Final cap area was in general accordance with the proposed cap area. See Appendix A for an overlay of design and constructed cap areas.
Excavation	1.0 foot	See Appendix A for as-built survey of capping area. The excavation depth could not be verified through available documentation
Cap Thickness	1.0 foot	Confirmed by construction observation.
Cap Material Gradation	See Table 5-3	Confirmed by construction observation.
Vegetation Planting Plan	Per Design Plans	Confirmed by construction observation.

Table 5-3. Upper Boat Launch Material and Spawning Mix Design Gradations

Sieve Size	Percent Passing (%)
Upper Boat Launch Material Design Gradation	
5/8 inch	95-100
¼ inch	50-75
No. 40	8-24
No. 200	10 (max)
Spawning Mix Design Gradation	
3 inch	100
2 inch	90-75
1 inch	75-50
¾ inch	50-35
½ inch	35-20
No. 4	20-10
No. 10	10-0
No. 40	5-0
No. 200	0

5.5. Final Inspection and Certifications

Ecology field personnel were on site during all phases of construction activities and accepted the work completed at the site in September 2007. Project activities were completed in general accordance with health and safety requirements contained in the specifications. There were no substantial problems or deviations.

5.6. Operations and Maintenance Activities

A formal monitoring plan was finalized by Ecology in September 2013. Monitoring activities include field observations to assess cap integrity, sediment deposition patterns, and health of introduced vegetation. The plan also requires discrete sampling of surficial material (i.e., deposited on the top of the surface layer of the cap) and of sub-cobble layer material (i.e., deposited sediment not to include any of the cap material). If suitable amounts of material are not present, then a sample is not taken and it is noted in the field book. Sediment/soil samples will be analyzed for arsenic, cadmium, lead, and zinc. Monitoring activities will occur every five years (starting in 2013) or during a year in which a 40,000 cubic foot per second flow event occurs in the Spokane River.

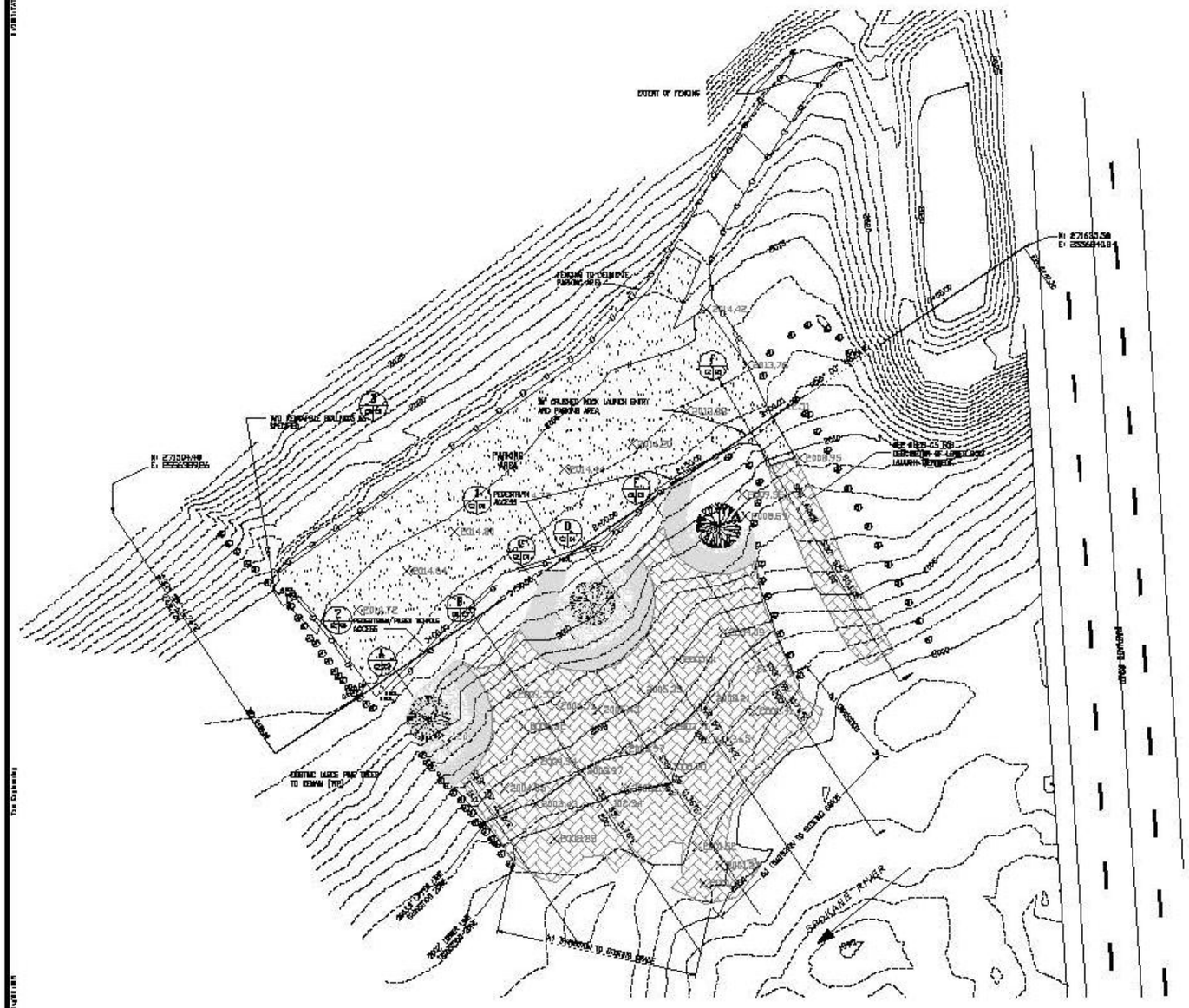
5.7. Contact Information

Table 5-4 provides contact information for the major design and remediation contractors and the state oversight lead.

Table 5-4. Contact Information

Project Role	Name	Organization	Address
Ecology Oversight	Zach Hedgpeth	Ecology	Toxics Cleanup Program- Eastern Region Office 4601 North Monroe Street Spokane, WA 99205
Field Engineer	Stephan Hannan	Ridolfi, Inc.	1011 Western Ave, Suite 1006 Seattle, WA 98104
Construction Contractor	Kip Silver	Able Cleanup Technologies	4117 E Nebraska Ave Spokane, WA 99217

Appendix A- As-Builts



CONSTRUCTION NOTES

1. Project work to be conducted during low flow period.
2. Material will not be placed in water.
3. Site will be closed to the public during construction.
4. Existing gravel parking area will be used for staging.
5. Work within buffer area around pine trees (as delineated) to be performed by hand or other approved method in order to protect pines.
6. Transition zone is from 1-foot deep excavation on upland edge to 1-foot cap on waterward edge. Total thickness of clean backfill/cap to be 1-foot throughout.
7. Upper boat launch to be constructed of 6-8 inches of crushed rock.
8. Extent of cap and boat launch toward river to be field determined.

GRAPHIC SCALE

30 0 30 60

LEGEND

- GRAVEL CAP AREA (3/4-INCH MINUS)
- SPAWNING CAP AREA
- TREE PROTECTION ZONE
- STATE PARKS FENCING
- 2000 — TOPOGRAPHIC CONTOUR
- BOLLARD
- EXISTING BOULDER PLACEMENT
- TREE
- EXISTING VEGETATION
- OH POLE — POWER POLE
- OHP — POWER LINE (OVERHEAD POWER)

SURVEY NOTES

1. Existing Ground was surveyed 8-18-08.
2. Excavation surface was surveyed 8-22-08.
3. Spawning backfill was surveyed 8-29-08.
4. Parking Area was surveyed 11-05-08.
5. The total excavation volume 426 cu. yd.
6. The total capping volume for spawning mix 724 cu. yd.
7. No volume calculated for 3/4"gravel cap.

SURVEYOR'S CERTIFICATE

I, Robert I. Hull, do hereby certify that I am a Registered Professional Land Surveyor, licensed by the State of Washington and that this as-built survey of Harvard Rd. as shown hereon, was prepared from an actual survey made on the ground under my supervision and accurately represents the site as it existed on the date of the survey.

Robert I. Hull P.L.S. REG. NO. 33153

NOTE; ALL EXCAVATION WORK MUST BE MONITORED BY THE PROJECT ARCHEOLOGIST

CALL 2 DAYS BEFORE YOU DIG 1-800-424-5555

May 2009
ACS
ACS
SWF
CHW

SPOKANE RIVER METALS SITES
HARVARD ROAD NORTH RECREATIONAL AREA
REMEDIAL ACTION
SPOKANE COUNTY, WASHINGTON

CAPPING PLAN

C2

501C

AS-BUILT
HARVARD ROAD
REMEDIAL ACTION PROJECT

PROJECT: Task # 08-108
DRAWN O: 08108
DESIGN BY:
DRAWN BY:
CHK BY:
LAST EDIT DATE: 11/03/08

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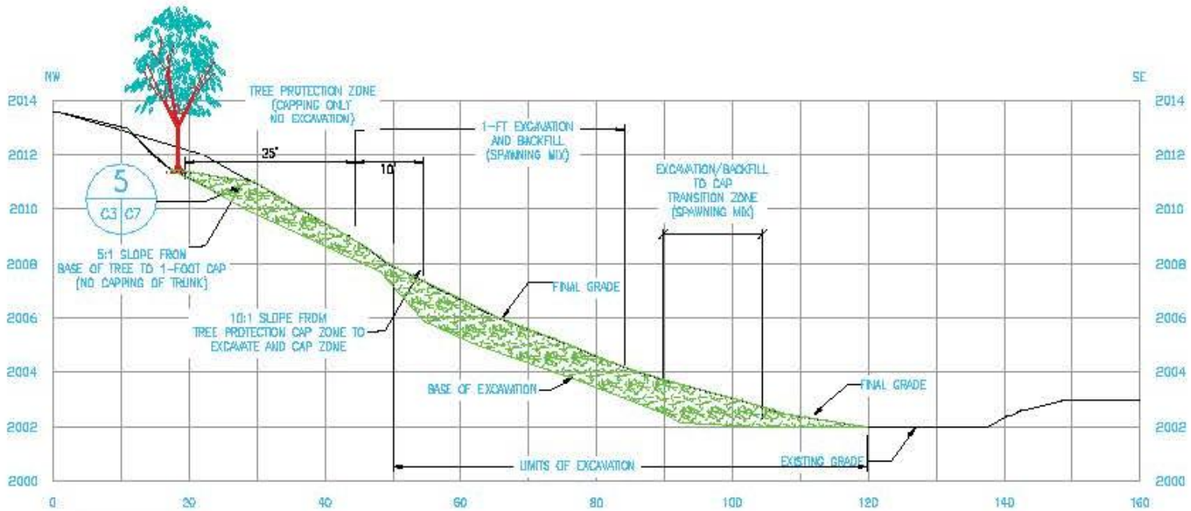
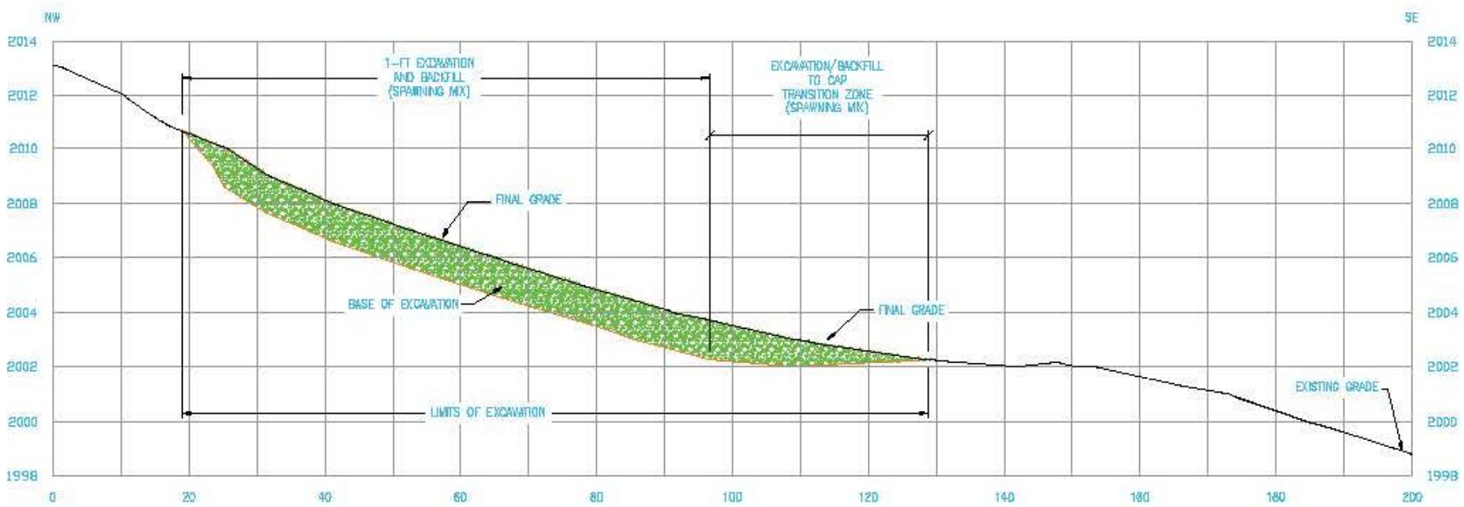
SHEET C2 OF C7



A STATION 0+73
C2 C3



B STATION 1+20
C2 C3

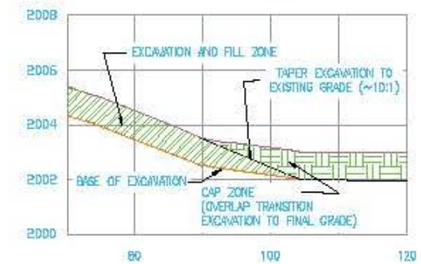
SPAWNING MIX MATERIAL

EXISTING GRADE

EXISTING AND FINAL GRADE

FINAL GRADE

BASE OF EXCAVATION



TYPICAL TRANSITION ZONE DETAIL

NOTE: ALL EXCAVATION WORK MUST BE MONITORED BY THE PROJECT ARCHEOLOGIST

0 5 10 20 30 40
Horizontal Scale in Feet

0.2 1 4 8 16
Vertical Scale in Feet

May 2008
ACS
ACS
SMF
CHW

SPOKANE RIVER METALS SITES
HARVARD ROAD NORTH RECREATIONAL AREA
REMEDIAL ACTION
SPOKANE COUNTY, WASHINGTON

CROSS SECTIONS

C3

501C

AS-BUILTS
HARVARD ROAD
REMEDIAL ACTION PROJECT

PROJECT: Task #88.100
DRAWING: AS-BUILT_SECTIONS
DESIGN BY:
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CHK BY:
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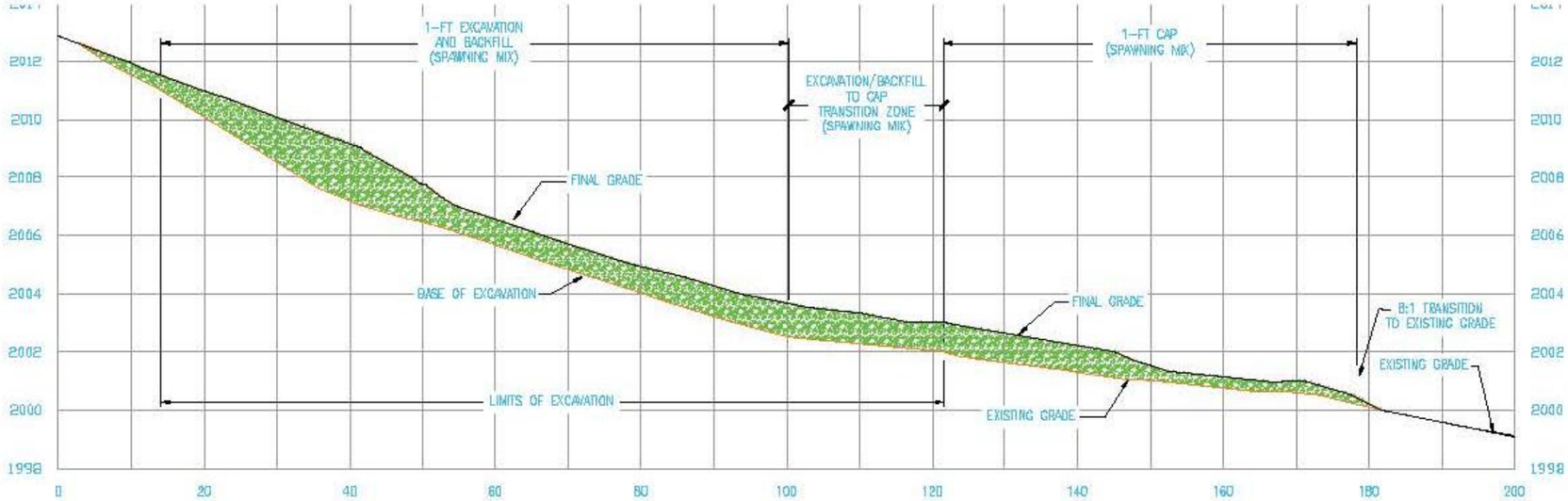
SHEET C3 OF C7



C C2 C4 STATION 1+55

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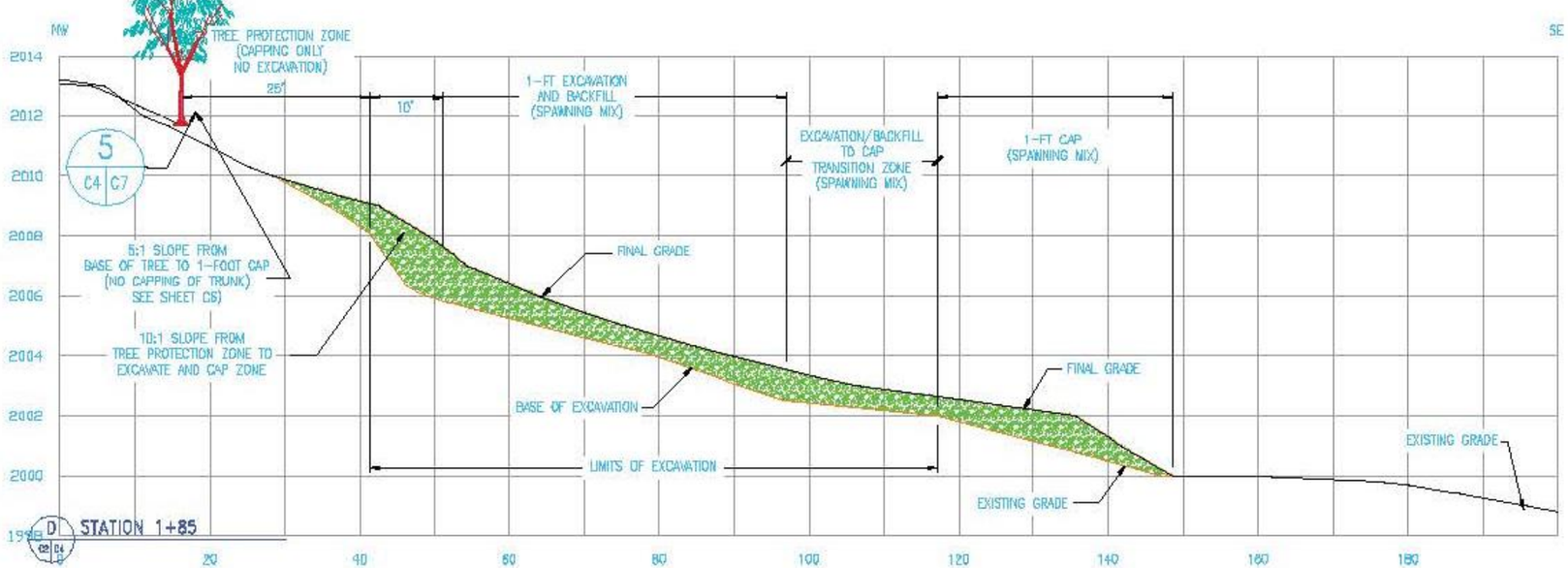
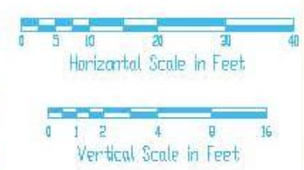


D C2 C4 STATION 1+85

LEGEND

- SPAWNING MIX MATERIAL
- EXISTING GRADE
- EXISTING AND FINAL GRADE
- FINAL GRADE
- BASE OF EXCAVATION



May 2008
ACS
ACS
SMF
CHM

SPOKANE RIVER METALS SITES
HARVARD ROAD NORTH RECREATIONAL AREA
REMEDIAL ACTION
SPOKANE COUNTY, WASHINGTON

CROSS SECTIONS

C4

501C

AS-BUILT
HARVARD ROAD
REMEDIAL ACTION PROJECT

PROJECT: Task #08.100
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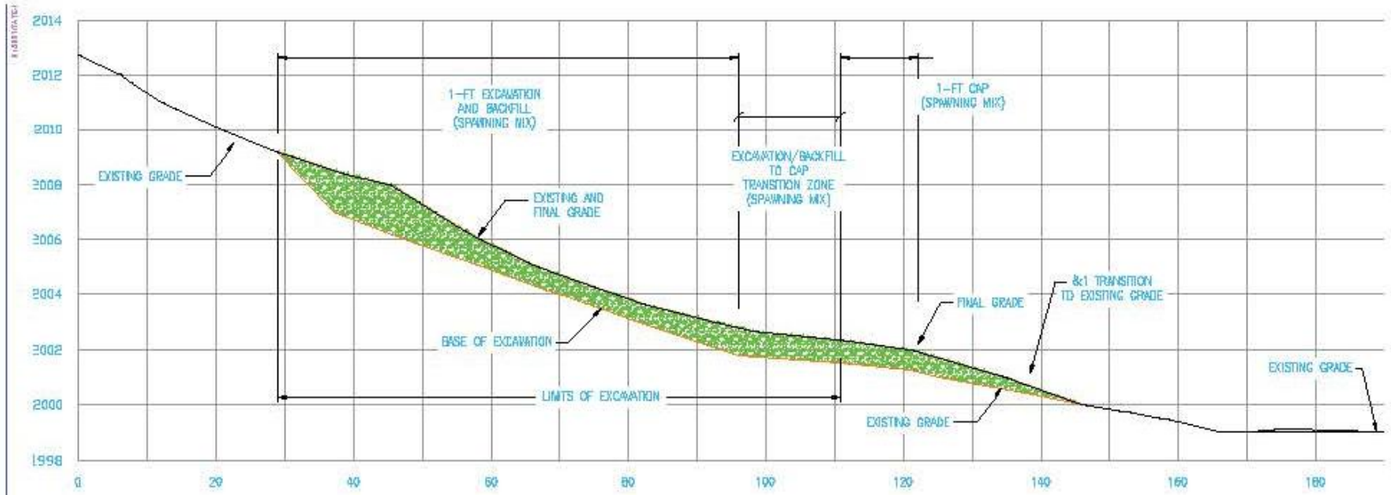
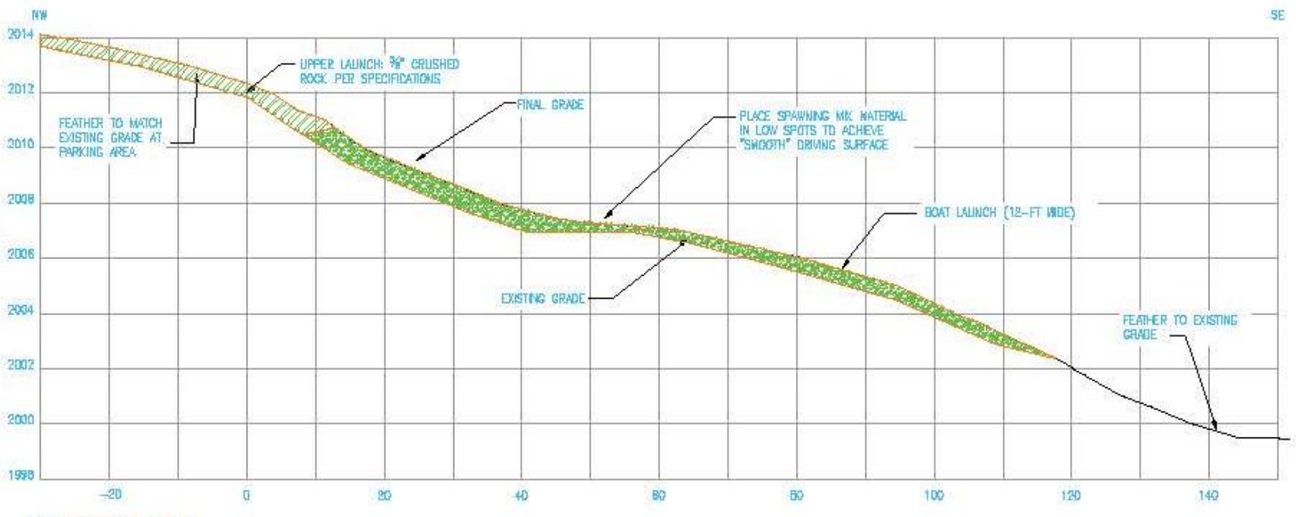
SHEET C4 OF C7



E C2 C5 STATION 2+25



F D2 C5 STATION 2+84

LEGEND

- SPAWNING MIX MATERIAL
- ¾" CRUSHED ROCK
- EXISTING GRADE
- EXISTING AND FINAL GRADE
- FINAL GRADE
- BASE OF EXCAVATION

BOAT LAUNCH CONSTRUCTION SEQUENCE:

1) ROLL LAUNCH AREA WITH COMPACTING EQUIPMENT TO ACHIEVE FIRM SUBGRADE AS DETERMINED BY ECOLOGY'S REPRESENTATIVE.
2) PLACE NOMINAL 6-INCH LIFT OF CRUSHED ROCK FROM PARKING AREA TO APPROXIMATELY 2010-FOOT ELEVATION.
3) PLACE SPAWNING MIX MATERIAL IN LOW SPOTS WITHIN EXISTING LAUNCH RAMP ALIGNMENT AS NEEDED TO ACHIEVE LEVEL SURFACE. EXTENT OF SPAWNING MIX APPLICATION TO BE FIELD DETERMINED BY ECOLOGY'S REPRESENTATIVE.

NOTE: ALL EXCAVATION WORK MUST BE MONITORED BY THE PROJECT ARCHEOLOGIST

0 5 10 20 30 40
Horizontal Scale In Feet

0 1 2 4 8 16
Vertical Scale In Feet

May 2008
ACS
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SWF
CHW

SPOKANE RIVER METALS SITES
HARVARD ROAD NORTH RECREATIONAL AREA
REMEDIAL ACTION
SPOKANE COUNTY, WASHINGTON

CROSS SECTIONS

C5

501C

AS-BUILT
HARVARD ROAD
REMEDIATL ACTION PROJECT

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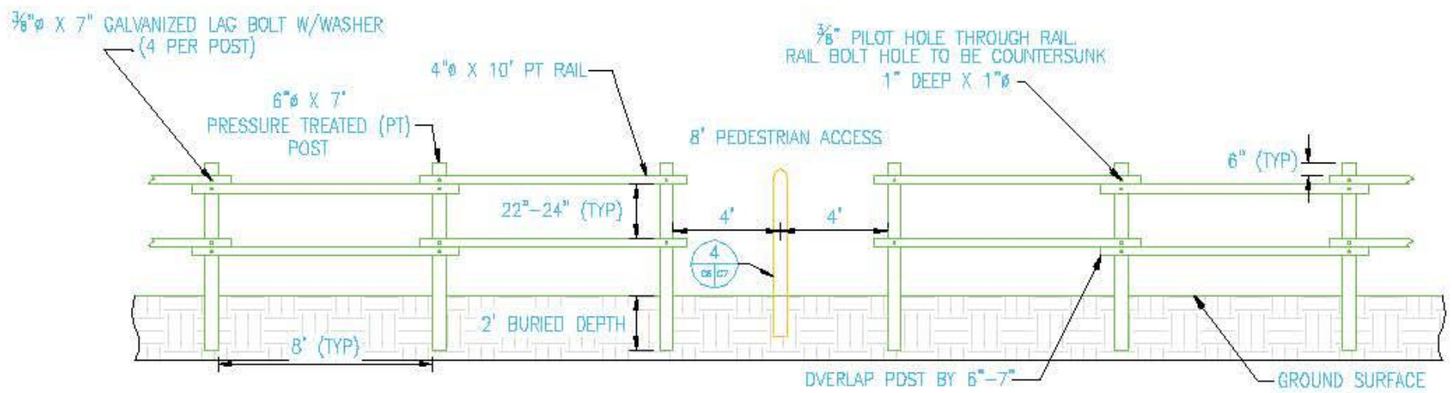
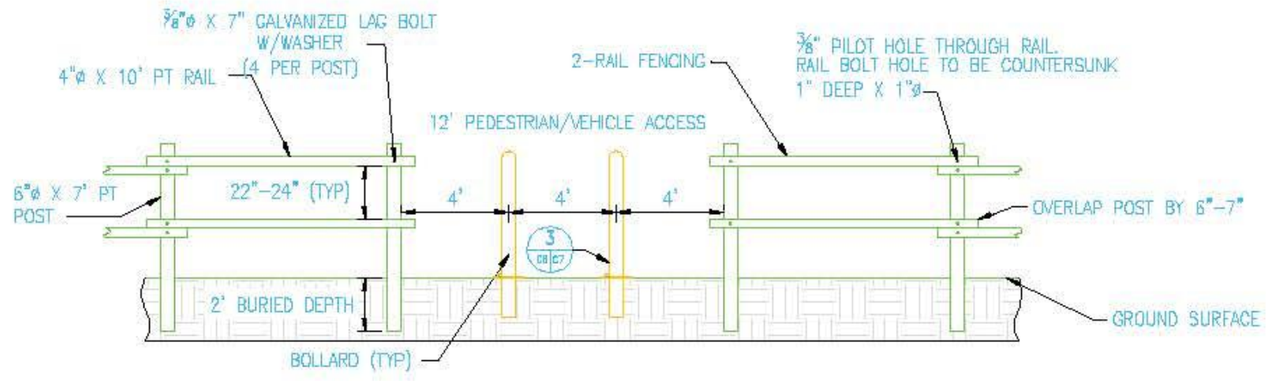
SHEET C5 OF C7



1 C2 C8 2-RAIL FENCING AND PEDESTRIAN ACCESS (TYP)
NTS



2 C2 C8 PEDESTRIAN/STATE PARK VEHICLE ACCESS (TYP)
NTS

May 2008
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SMF
CHW

SPOKANE RIVER METALS SITES
HARVARD ROAD NORTH RECREATIONAL AREA
REMEDIAL ACTION
SPOKANE COUNTY, WASHINGTON

CONSTRUCTION DETAILS

C6

5010

AS-BUILTS
HARVARD ROAD
REMEDIAL ACTION PROJECT

PROJECT: Title # 08.100
DRAWING: AS-BUILTS
DESIGN BY:
DRAWN BY:
CHECK BY:
LAST EDIT DATE: 11-13-08

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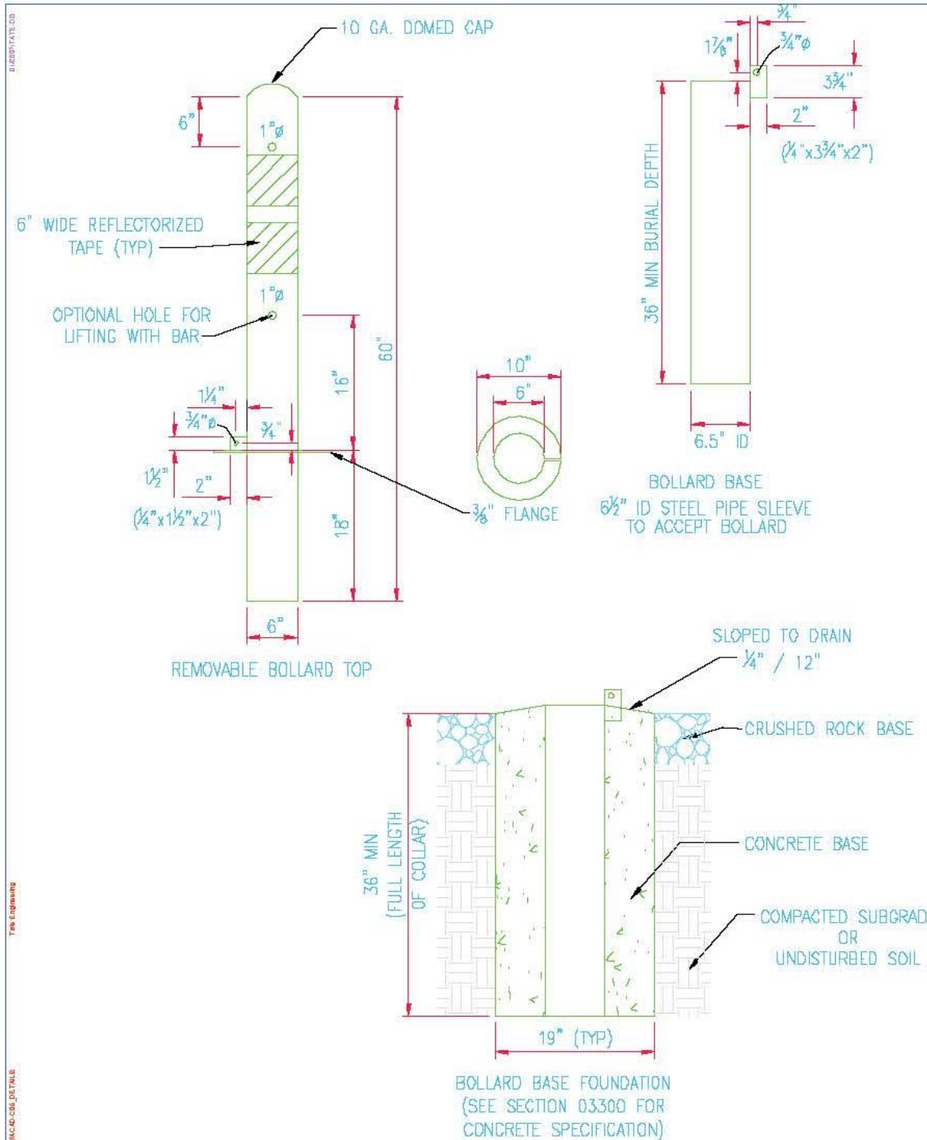
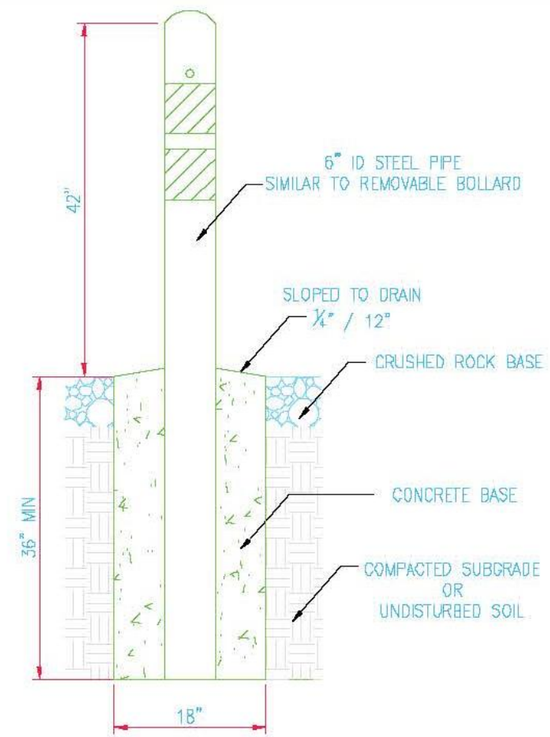


3 REMOVABLE BOLLARD (TYP)
C6 D8 NTS



4 PERMANENT BOLLARD (TYP)
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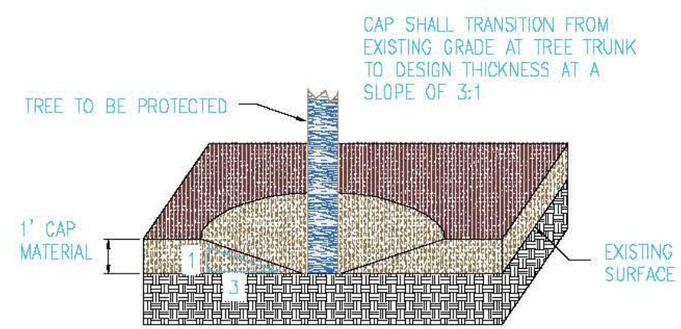


5 TREE PROTECTION CAPPING (TYP)
C3 C7 NTS

MARCH 2008
ACS
ACS
SMT

SPOKANE RIVER METALS SITES
HARVARD ROAD RECREATIONAL AREA
REMEDIAL ACTION
SPOKANE COUNTY, WASHINGTON

CONSTRUCTION DETAILS
90% DESIGN

AS-BUILTS
HARVARD ROAD
REMEDIAL ACTION PROJECT

PROJECT: Tate # 08.00
DRAWING: ACAD CAD_DETAILS
DESIGN BY:
DRAWN BY:
CHK BY:
LAST EDIT DATE: 11/03/08

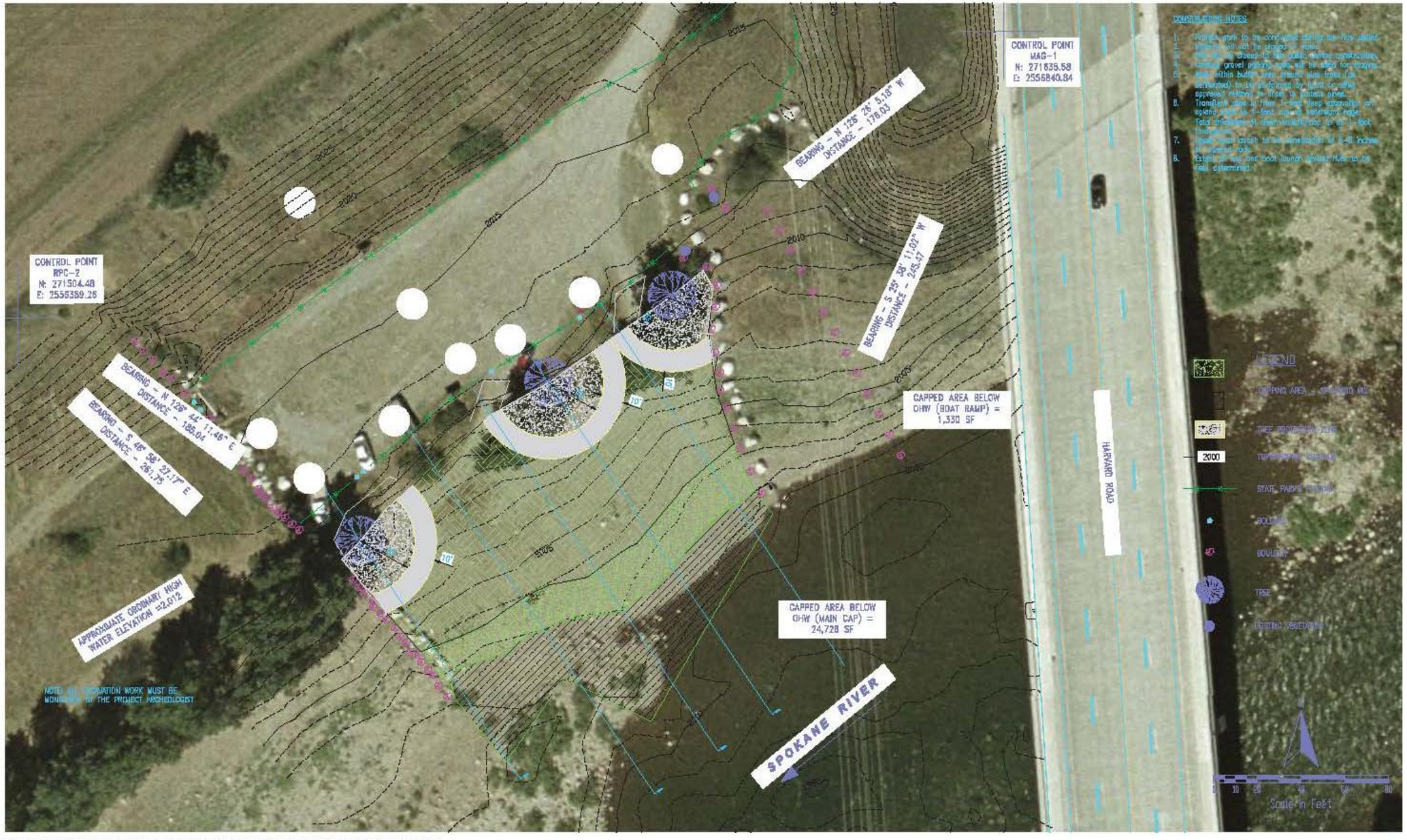
REVISIONS
NO. DESCRIPTION DATE

TATE ENGINEERING
1103 N. 4th Street
Coeur d' Alene
Idaho, 83814
(208)676-8708
FAX: (208)667-2129
E-MAIL: ttate@tate-eng.com

C7

SHEET C7 OF C7

591C



Reference: Aerial photo courtesy of Aviato. GeoEngineers added the aerial photo to the surveyors contour map.

GEOENGINEERS

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. This figure was originally produced in color.

Harvard Road
Remedial Action As-Built

Spokane River Metals Sites
Spokane County, Washington

Barker Road North Remedial Action Report

6. Barker Road North Remedial Action Report

6.1. Background

The Barker Road North Project Site is located on the north bank of the Spokane River, east of and adjacent to the existing Barker Road Bridge.

Requirements specified in the ROD including RAOs and cleanup levels are described in the Introduction to the Spokane River Beach Cleanup Sites Remedial Action Reports.

The Remedial Action at Barker Road North consisted of installation of an engineered, hydraulically stable cap. Key elements of the remedial design included:

- Excavation of contaminated sediments for the purpose of achieving the specified cap thickness within the maximum allowed obstruction thickness.
- Placement of four inches of filter rock, followed by sixteen inches of capping rock.

The remedial action design was completed in general accordance with the requirements of the ROD, the 90% Design, and EPA's comments on the 90% Design.

6.2. Construction Activities

Pre-construction Sampling

In 2006, seven samples were collected within the Project Site boundaries to characterize sediment contamination. Pre-excavation results indicate that four samples exceeded the established EPA ROD cleanup level for lead (700 mg/kg) for the Spokane River project sites in Washington.

Prior to the remedial action, three composite samples were collected within the Project Site from the full thickness of the proposed excavation. These composite samples were analyzed for total Resource Conservation and Recovery Act (RCRA) 8 metals and the sample with the greatest concentration of lead was also analyzed for leachable lead using the Toxicity Characteristic Leaching Procedure (TCLP) extraction method followed by total metals analysis. The detected TCLP lead concentration was 0.124 milligrams per liter (mg/l). The excavated material was characterized as solid waste based on these analytical test results.

Bidding/Contractor Selection

Ecology bid the project in August 2012. The construction contract was awarded to Piersol Construction, who implemented the remedial action.

Health and Safety

Project activities were completed in accordance with health and safety requirements contained in the contract specifications, which required use of HAZWOPER-trained staff. Both GeoEngineers and the contractor prepared and implemented their own health and safety plans.

Site Access

The Project Site was accessed by a path connected to the northeast side of Barker Road Bridge. Site access required removal of a ponderosa pine tree which was later replanted when capping activities at the site were completed.

Excavation and Disposal

Construction activities occurred within the FEMA floodplain and required placing filter rock and capping material within a Special Flood Hazard Area located within an "AE Zone" (per FEMA Flood Insurance Rate Map 578D). Because activities were in an "AE Zone" without a regulatory floodway, the project was limited to a 0.1 foot increase in the base flood elevation (BFE). In order to limit the increase of the BFE to 0.1 feet or less, existing sediments were excavated to a depth of about 1.1 feet within the cap area to accommodate the thickness of the rock filter and capping materials.

The excavated material was characterized as solid waste based on chemical analysis. The waste material was removed and transported off site for disposal at Waste Management's, RCRA Subtitle D, Graham Road landfill located in Medical Lake, Washington.

Post-Excavation Sampling

Before capping existing sediments, seven soil samples were collected from within the site limits to document metals concentrations of material remaining in-place beneath the cap. Post-excavation results indicate that no samples exceeded the EPA cleanup level f for arsenic (20 mg/kg). Analyses indicated lead concentrations were less than established cleanup levels. The samples with the greatest concentrations of arsenic and lead were also analyzed using the Synthetic Precipitation Leaching Procedure (SPLP) extraction followed by total metals analysis; arsenic and lead were not detected at concentrations above method reporting limits using this analysis.

Cap Material

Imported material was sourced from Central Pre-Mix Concrete Co. in Spokane Washington. Ecology and GeoEngineers field personnel visually observed import material prior to placement. Piersol blended the material in the field to achieve specified gradations. In addition, a significant number of existing boulders were recovered during excavation, and integrated into the cap. Field mixing techniques combined with the use of existing boulders provided gradations in general accordance with the remedial design plans and specifications.

Filter Rock Placement

The project design specified 4 inches of filter rock material meeting the design gradation. Filter rock was placed and compacted using a vibratory plate compacter with a minimum of three passes.

Capping Material Placement

The project design specified 16 inches of rock capping material. Once the placement of the filter rock layer was complete, a mini-excavator was used to set and compact the capping material, using the back of the bucket for tamping.

Survey

A post excavation survey was completed during the excavation phase to document constructed excavation depths. Following the placement of capping material, a final survey was completed to document horizontal and vertical constructed limits. Survey results indicated the final thickness and capping area were in accordance with the project design plans and specifications.

Riparian Vegetarian Planting

The project plan included a native riparian vegetation planting plan consisting of four riparian plant species. Vegetation was planted throughout the site by a local river users group and Washington State Parks. GeoEngineers did not observe vegetation planting during the dates while personnel were on site.

6.3. Chronology of Events

The chronology of site activities is described in Table 6-1.

Table 6-1. Chronology of Events

Date	Activities
2006	Pre-construction sampling: seven samples were collected within the Project Site boundaries to characterize sediment contamination.
August 2012	Ecology bid the project. Contract was awarded.
August 17, 2012	Three composite samples were collected within the Project Site from the full thickness of the proposed excavation.
September 25, 2012	Piersol Construction Inc. mobilized to the site earlier in the week and began excavation activities. Seven samples were collected prior to the placement of the cap material to document existing conditions. Sample locations were logged using an iPad equipped with global positioning system (GPS) and Global Information System (GIS) applications. Samples were analyzed for total and leachable arsenic and lead.
September 25, 2012	Pre Capping survey performed. Placement of filter material and cap material began.
September 27, 2012	Continued filter and cap placement
September 28, 2012	Last day GeoEngineers staff was on the site to observe cap placement. Piersol de-mobilized from the site shortly thereafter.

6.4. Performance Standards and Construction Quality Control

The construction of the remedial cap was completed in general accordance with the remedial design plans and specifications. The project design report identified the following performance metrics for the work which are summarized below in Table 6-2:

Table 6-2. Remedial Action Performance Metrics

Performance Metric	Remedial Design Criteria	Comment
Cap Area	8,855 square feet	Final cap area was in general accordance with the proposed cap area. See Appendix A for an overlay of design and constructed cap areas..
Excavation	1.07 feet	Observed to meet the depth metric
Filter Thickness	0.33 feet	Confirmed by construction observation.
Filter Material Gradation	See Table 6-3	Confirmed by construction observation.
Cap Thickness	1.33 feet	Confirmed by construction observation.
Cap Material Gradation	See Table 6-3	Confirmed by construction observation.
Maximum allowed obstruction thickness to prevent 100-year base flood elevation by more than 0.1 feet.	0..6 feet	See Appendix A4 for as-built survey of capping area. Based on a review of the as-built survey, the maximum allowed obstruction thickness was achieved within a +/-0.1-foot tolerance, which is reasonable for this type of construction.

Table 6-3. Rock Filter and Rock Capping Design Gradations

Sieve Size	Percent Passing (%)
Rock Filter Design Gradation	
1-1/2 inch	95-100
1 inch	33-55
½ inch	25-45
No. 40	5 (max)
Total Thickness (inches)	4
Rock Capping Design Gradation	
12 inch	100
8 inch	40-60
4 inch	10-25
½ inch	2 (max)
Total Thickness (inches)	16

6.5. Final Inspection and Certifications

Ecology field personnel were on site during all phases of construction activities and accepted the work completed at the site in September 2012. Project activities were completed in general accordance with health and safety requirements contained in the specifications, which required use of HAZWOPER-trained staff. Both GeoEngineers and the contractor prepared and

implemented their own health and safety plans. There were no substantial problems or deviations.

6.6. Operations and Maintenance Activities

A formal monitoring plan was finalized by Ecology in September 2013. Monitoring activities include field observations to assess cap integrity and sediment deposition patterns. The plan also requires discrete sampling of surficial material (i.e., deposited on the top of the surface layer of the cap) and of sub-cobble layer material (i.e., deposited sediment not to include any of the cap material). If suitable amounts of material are not present, then a sample is not taken and it is noted in the field book. Sediment/soil samples will be analyzed for arsenic, cadmium, lead, and zinc. Monitoring activities will occur every five years (starting in 2017) or during a year in which a 40,000 cubic foot per second flow event occurs in the Spokane River.

6.7. Contact Information

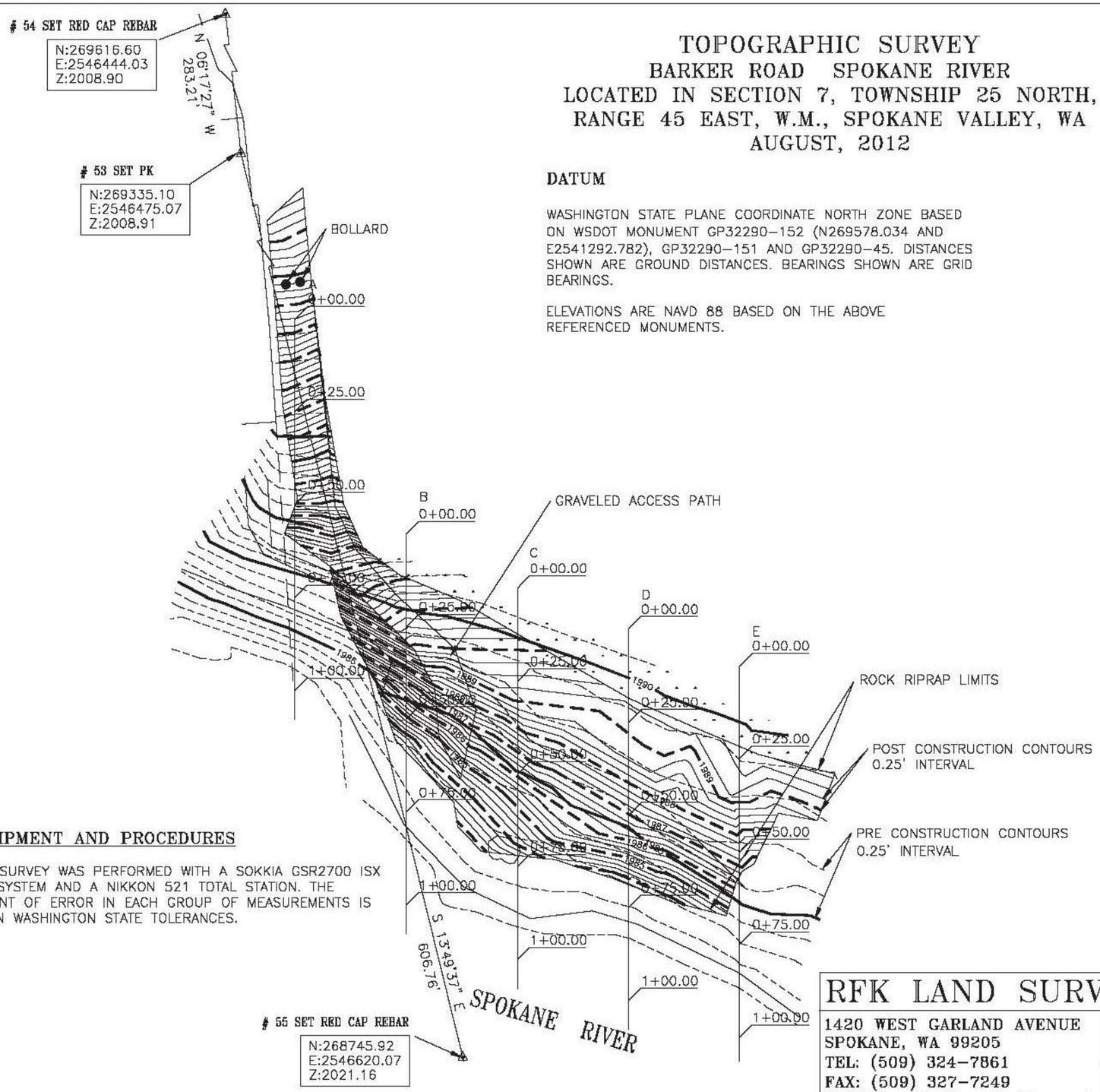
Table 6-4 provides contact information for the major design and remediation contractors and the state oversight lead.

Table 6-4. Contact Information

Project Role	Name	Organization	Address
Ecology Oversight	Brendan Dowling	Ecology	Toxics Cleanup Program- Eastern Region Office 4601 North Monroe Street Spokane, WA 99205
Project Engineer	John Haney	GeoEngineers, Inc.	523 East Second Avenue Spokane, WA 99202
Construction Contractor	Eric Risher	Piersol Construction, Inc.	2233 South Garfield Road Airway Heights, WA 99001

Appendix A- As-Builts

TOPOGRAPHIC SURVEY
BARKER ROAD SPOKANE RIVER
LOCATED IN SECTION 7, TOWNSHIP 25 NORTH, RANGE 45 EAST, W.M., SPOKANE VALLEY, WA
AUGUST, 2012



DATUM

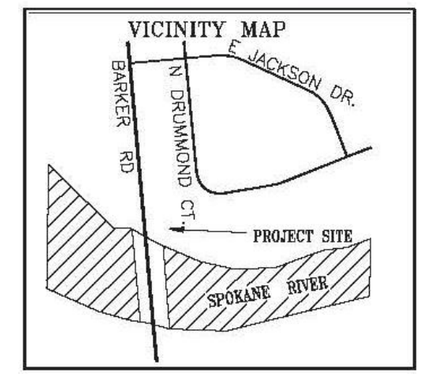
WASHINGTON STATE PLANE COORDINATE NORTH ZONE BASED ON WSDOT MONUMENT GP32290-152 (N269578.034 AND E2541292.782), GP32290-151 AND GP32290-45. DISTANCES SHOWN ARE GROUND DISTANCES. BEARINGS SHOWN ARE GRID BEARINGS.

ELEVATIONS ARE NAVD 88 BASED ON THE ABOVE REFERENCED MONUMENTS.

NORTH

SCALE 1" = 30 FEET

0' 30' 60' 90'



EQUIPMENT AND PROCEDURES

THIS SURVEY WAS PERFORMED WITH A SOKKIA GSR2700 ISX GPS SYSTEM AND A NIKKON 521 TOTAL STATION. THE AMOUNT OF ERROR IN EACH GROUP OF MEASUREMENTS IS WITHIN WASHINGTON STATE TOLERANCES.

SURVEYORS CERTIFICATE

I HEREBY CERTIFY THAT THIS TOPOGRAPHIC SURVEY WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION.
DATE:

SIGNATURE: _____

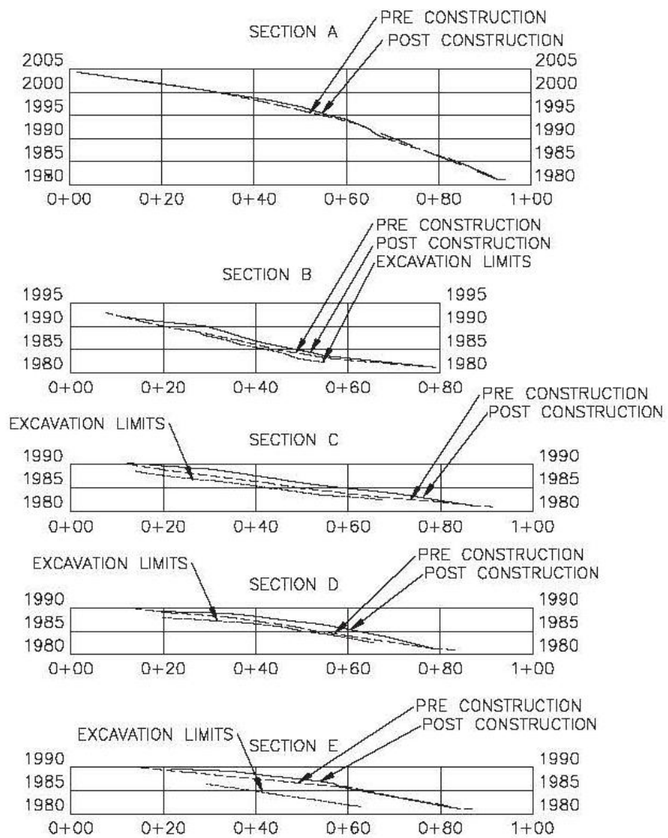
REGISTRATION NO. 33141

RUDY F. KITZAN
STATE OF WASHINGTON
33141
REGISTERED
PROFESSIONAL LAND SURVEYOR

RFK LAND SURVEYING INC.
1420 WEST GARLAND AVENUE
SPOKANE, WA 99205
TEL: (509) 324-7861
FAX: (509) 327-7249
E-MAIL: rfkls@qwestoffice.net

DRAWN	APPROVED	SCALE	PROJECT
RFK	RFK	1"=30'	12-149
DATE	DATE	SHEET	FIELD BOOK
11/13/12	11/13/12	1 OF 2	80

TOPOGRAPHIC SURVEY
BARKER ROAD SPOKANE RIVER
LOCATED IN SECTION 7, TOWNSHIP 25 NORTH, RANGE 45 EAST, W.M., SPOKANE VALLEY, WA
AUGUST, 2012



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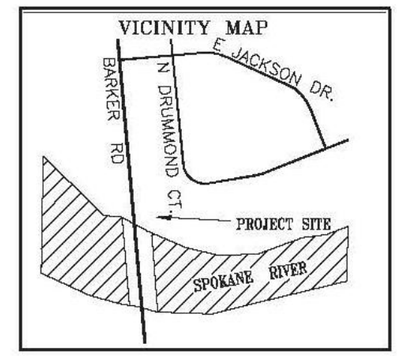

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SPOKANE, WA 99205
TEL: (509) 324-7861
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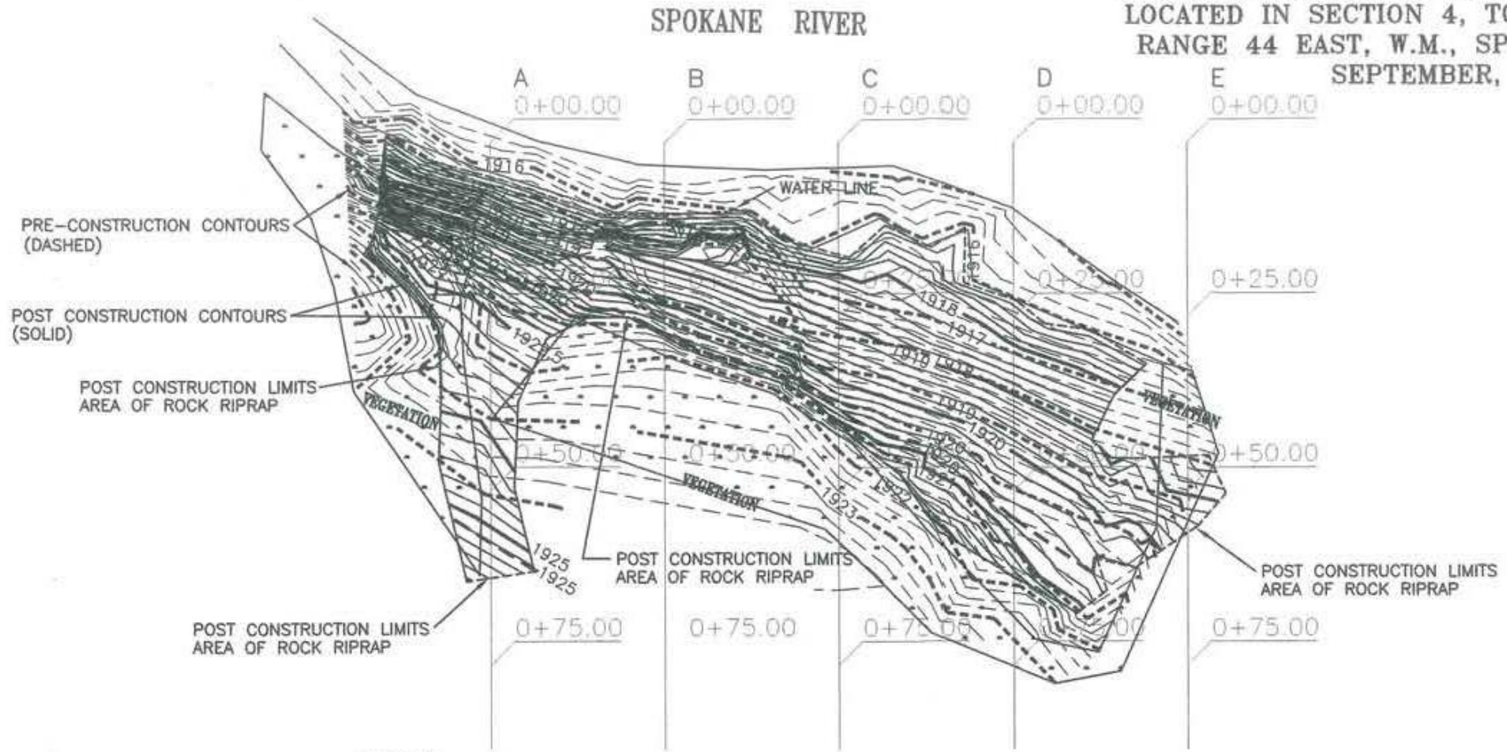
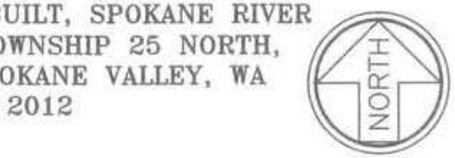
E-MAIL: rfkls@qwestoffice.net

DRAWN	APPROVED	SCALE	PROJECT
RFK	RFK	1"=30'	12-149
DATE	DATE	SHEET	FIELD BOOK
09/25/12	09/25/12	2 OF 2	80

TOPOGRAPHIC SURVEY

MYRTLE POINT BEACH AS BUILT, SPOKANE RIVER
LOCATED IN SECTION 4, TOWNSHIP 25 NORTH,
RANGE 44 EAST, W.M., SPOKANE VALLEY, WA
SEPTEMBER, 2012





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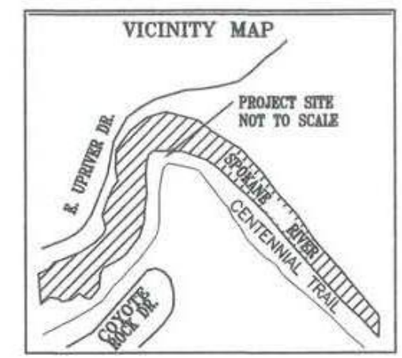

DATUM

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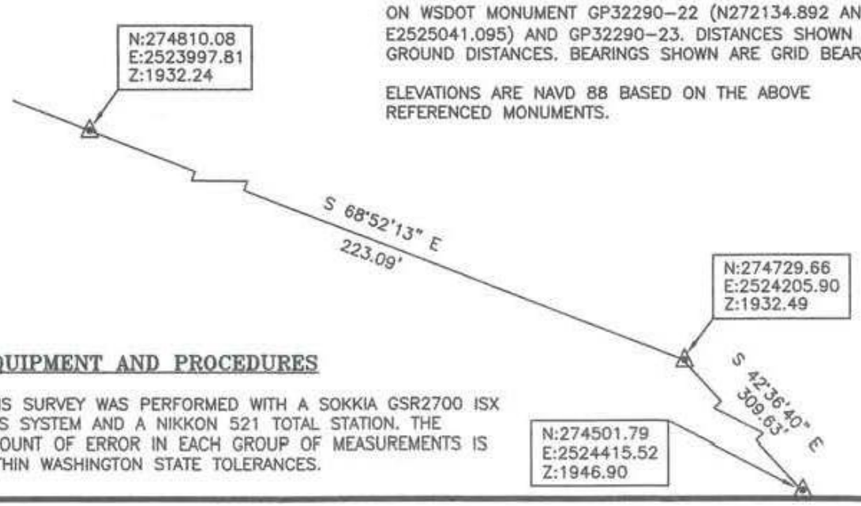
ELEVATIONS ARE NAVD 88 BASED ON THE ABOVE REFERENCED MONUMENTS.



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REGISTRATION NO. 33141

EQUIPMENT AND PROCEDURES

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RFK LAND SURVEYING INC.
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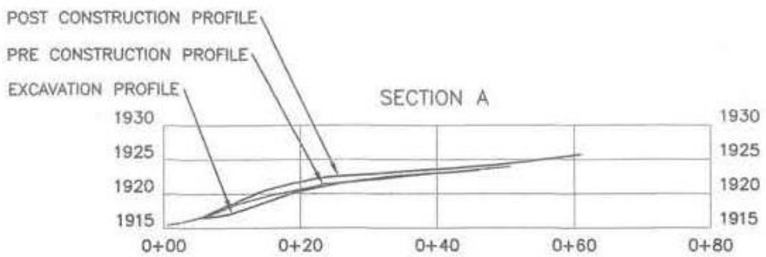
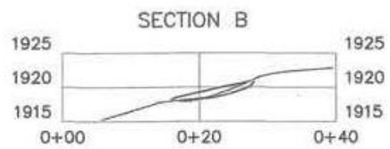
FAX: (509) 327-7249
E-MAIL: lsrfkitzan@qwestoffice.net

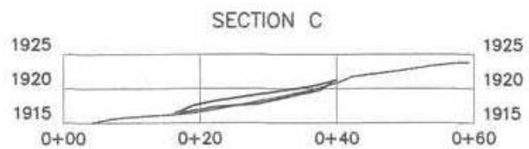
DRAWN	APPROVED	SCALE	PROJECT
RFK	RFK	1"=20'	12-149
DATE	DATE	SHEET	FIELD BOOK
11/19/12	11/19/12	1 OF 2	80

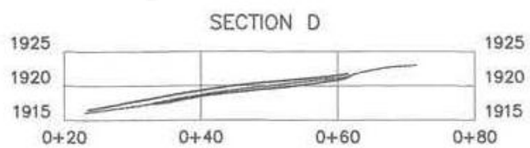
TOPOGRAPHIC SURVEY

MYRTLE POINT BEACH AS BUILT, SPOKANE RIVER
LOCATED IN SECTION 4, TOWNSHIP 25 NORTH,
RANGE 44 EAST, W.M., SPOKANE VALLEY, WA
SEPTEMBER, 2012









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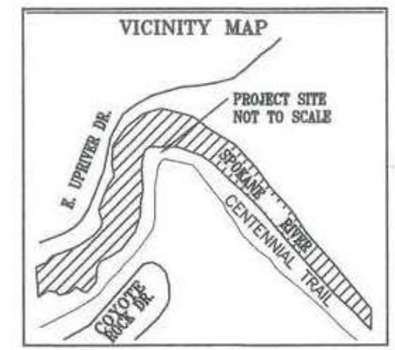

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DATE:

SIGNATURE:

REGISTRATION NO. 33141

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DRAWN	APPROVED	SCALE	PROJECT
RFK	RFK	1"=20'	12-149
DATE	DATE	SHEET	FIELD BOOK
11/19/12	11/19/12	2 OF 2	80

TOPOGRAPHIC SURVEY
BARKER ROAD - SPOKANE RIVER
LOCATED IN SECTION 7, TOWNSHIP 25 NORTH, RANGE 45 EAST, W.M., SPOKANE VALLEY, WA
AUGUST, 2012

DATUM

WASHINGTON STATE PLANE COORDINATE NORTH ZONE BASED ON WSDOT MONUMENT GP32290-152 (N269578.034 AND E2541292.782), GP32290-151 AND GP32290-45. DISTANCES SHOWN ARE GROUND DISTANCES. BEARINGS SHOWN ARE GRID BEARINGS.

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EQUIPMENT AND PROCEDURES

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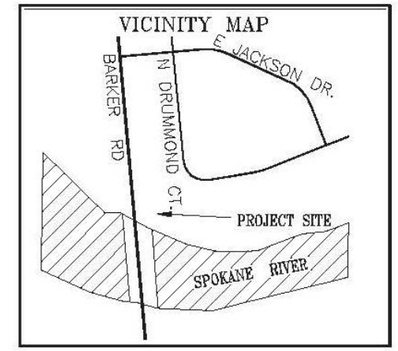
Reference: Aerial photo courtesy of Ariete. GeoEngineers added the aerial photo to the surveyors contour map.

NORTH

SCALE 1" = 30 FEET

0' 30' 60' 90'

VICINITY MAP



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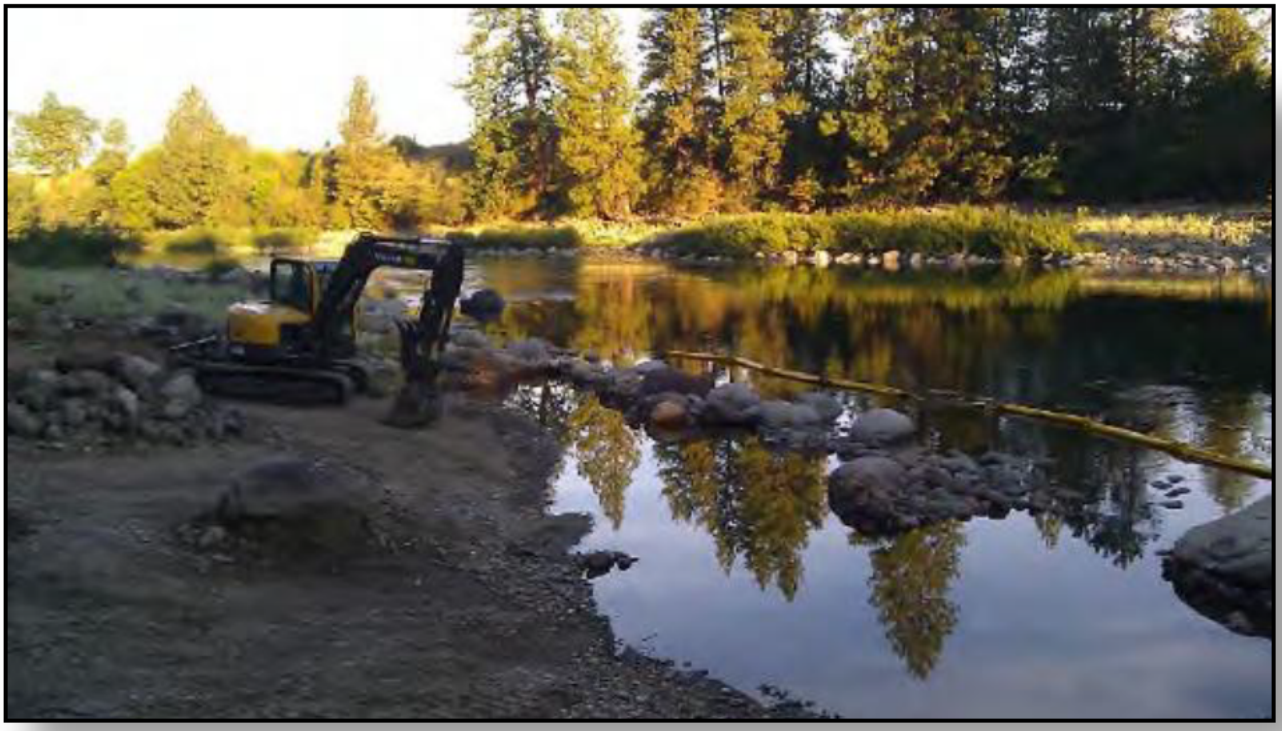
DRAWN	APPROVED	SCALE	PROJECT
RFK	RFK	1"=30'	12-149
DATE	DATE	SHEET	FIELD BOOK
11/13/12	11/13/12	1 OF 2	80

Flora Road Remedial Action Report



7. Flora Road Remedial Action Report

7.1. Background

The Flora Road Site is located on the south side of the Spokane River, approximately 7,300 feet downstream of the North Barker Road Bridge and immediately north of the intersection of North Flora Road and East Montgomery Avenue.

The Remedial Action at Flora Road consisted of installation of an engineered, hydraulically stable cap. Key elements of the remedial design included:

- Excavation of contaminated sediments for the purpose of achieving the specified cap thickness within the maximum allowed obstruction thickness.
- Placement of four inches of filter rock, followed by sixteen inches of capping rock.

The remedial action design was completed in general accordance with the requirements of the ROD, the 90% Design, and EPA's comments on the 90% Design.

7.2. Construction Activities

Pre-construction Sampling

In 2006, seven samples were collected within the Project Site boundaries to characterize sediment contamination. Pre-excavation results indicate that one sample exceeded the cleanup level for lead (700 mg/kg) for the Spokane River project sites in Washington; none of the samples exceeded EPA's cleanup level for arsenic (20 mg/kg).

Bidding/Contractor Selection

Ecology bid the project in August 2012. The construction contract was awarded to Piersol Construction, who implemented the remedial action.

Health and Safety

Project activities were completed in accordance with health and safety requirements contained in the contract specifications, which required use of HAZWOPER-trained staff. Both GeoEngineers and the contractor prepared and implemented their own health and safety plans.

Site Access

Piersol accessed the site using the asphalt-paved road that connects the Centennial Trail (Trail) to the Intersection of North Flora Road and East Montgomery Avenue.

Erosion and Sediment Control

Prior to site disturbance, sediment control best management practices (BMPs) were installed around the construction workspace (including within the river) to contain sediment and spoils. The design of detailed BMPs was not within GeoEngineers' design scope of services. GeoEngineers field personnel provided observation services only, recommending and documenting erosion and sediment control measures implemented by the contractor. The contractor installed and maintained appropriate sediment control devices throughout the site in accordance with the applicable local, state, and federal regulations.

Archeological observation

Plateau Archaeological Investigations, LLC (Plateau) provided archeological observation during all excavation activity on site. No Native American or historic-era cultural materials or features were observed during the monitoring.

Pre-excavation Sampling

Prior to the remedial action (August 17, 2012), four composite samples were collected within the Project Site from the full thickness of the proposed excavation. These composite samples were analyzed for total Resource Conservation and Recovery Act (RCRA) 8 metals and the sample with the greatest concentration of lead was also analyzed for leachable lead using the Toxicity Characteristic Leaching Procedure (TCLP) extraction method followed by total metals analysis. The detected TCLP lead concentration was 0.639 milligrams per liter (mg/l). The excavated material was characterized as solid waste based on these analytical test results.

Excavation and Disposal

Construction activities occurred within the FEMA floodplain and required placing filter rock and capping material within a Special Flood Hazard Area located within an "AE Zone" (per FEMA Flood Insurance Rate Map 578D). Because activities were in an "AE Zone" without a regulatory floodway, the project was limited to a 0.1 foot increase in the base flood elevation (BFE). In order to limit the increase of the BFE to 0.1 feet or less, existing sediments were excavated to a depth of about 1.3 feet (15 inches) within the cap area to accommodate the thickness of the rock filter and capping materials.

The excavated material was characterized as solid waste based on TCLP analysis for lead. Piersol removed the waste material and transported it off site for disposal at Waste Management's, RCRA Subtitle D, Graham Road landfill located in Medical Lake, Washington.

Post-Excavation Sampling

Following soil removal, GeoEngineers collected seven soil samples from the excavated limits to document metals concentrations of material remaining in-place beneath the cap. Post-excavation results indicate that no samples exceeded the established EPA ROD cleanup level for lead (700 mg/kg); none of the samples exceeded the EPA cleanup level of 20 mg/kg for arsenic. Three samples

exceeded the State goal for arsenic (10 mg/kg) and, therefore, the State capped the remaining soil. The samples with the greatest concentrations of arsenic and lead were also analyzed using the Synthetic Precipitation Leaching Procedure (SPLP) extraction followed by total metals analysis; analytical results list both the SPLP arsenic concentration and the SPLP lead concentration as non-detects.

Cap Material

Piersol delivered and stockpiled 12-inch-minus rock, 1½-inch-minus gravel, and ¾-inch-minus gravel. The three size class stockpiles were located on vacant land north of and adjacent to Flora Road. Imported material was sourced from Central Pre-Mix Concrete Co. in Spokane Washington. Ecology and GeoEngineers field personnel visually observed import material prior to placement. Piersol blended the material in the field to achieve specified gradations. In addition, a significant number of existing boulders were recovered during excavation, and integrated into the cap. Field mixing techniques combined with the use of existing boulders provided gradations in general accordance with the remedial design plans and specifications.

Filter Rock Placement

The project design specified 4 inches of filter rock material meeting the design gradation. Once excavation was complete, Piersol placed and compacted filter rock in two, 2-inch lifts, each compacted using a vibratory plate compacter with a minimum of three passes.

Capping Material Placement

The project design specified 16 inches of capping material. Once the placement of the filter rock layer was complete, Piersol used a mini-excavator to set and compact the capping material, using the back of the bucket for tamping.

Survey

RFK Surveying Inc. completed a post excavation survey during the excavation phase of the project to document constructed excavation depths. Following the placement of capping material, RFK completed a final survey to document horizontal and vertical constructed limits. Survey results indicated the final thickness and capping area were in accordance with the project design plans and specifications.

7.3. Chronology of Events

The chronology of site activities is described in Table 7-1.

Table 7-1. Chronology of Events

Date	Activities
2006	Pre-construction sampling: seven samples were collected within the Project Site boundaries to characterize sediment contamination.
2007	Ecology bid the project. Contract was awarded.

Date	Activities
August 17, 2012	Four composite samples were collected within the Project Site from the full thickness of the proposed excavation
September 12, 2012	Piersol Construction Inc. mobilized to the site. Erosion controls were implemented and site excavation began. Traffic control was also established.
September 13, 2012	Hauling excavated material to the disposal site and site excavation activities continued. Extra capping area was identified and total capping area was delineated. Total area was estimated to be 0.15 acres. Survey control was set up.
September 14, 2012	Site excavation and material disposal activities continued. A site visit to the Piersol quarry pit identified a shortage of acceptable 8" – 12" material. Another source of acceptable capping material would need to be found for construction to continue.
September 17, 2012	New sources of 8" – 12" material were found and mixed on site with 8" minus material to meet specified gradation. Four inches of rock filter material were placed followed by placement of the rock cap. Boulders harvested on site were set into the rock cap
September 18, 2012	Placement of the rock capping material continued. The 8" – 12" material was mixed with the 8-inch minus material on site and tamped into place with an excavator bucket. Additional capping material was placed (round large boulders). GeoEngineers left the site, Piersol finished the site and demobilized later that week
November 16, 2012	The final survey was completed.

7.4. Performance Standards and Construction Quality Control

Piersol completed the construction of the remedial cap in general accordance with the remedial design plans and specifications. The project design report identified the following performance metrics for the work:

Table 7-2. Remedial Action Performance Metrics

Performance Metric	Remedial Design Criteria	Comment
Cap Area	10,497 square feet	Final cap area was in general accordance with the proposed cap area. See Appendix A for an overlay of design and constructed cap areas..
Excavation	1.27 feet	See Appendix A for as-built survey of capping area. The excavation depth was not designated for contaminated material removal, but was established as a means to achieve the specified cap thickness within the maximum allowed obstruction thickness (see below).
Filter Thickness	0.33 feet	Confirmed by construction observation.
Filter Material Gradation	See Table 7-3	Confirmed by construction observation.
Cap Thickness	1.33 feet	Confirmed by construction observation.
Cap Material Gradation	See Table 7-3	Confirmed by construction observation.
Maximum allowed obstruction thickness to prevent 100-year base flood elevation by more than 0.1 feet.	0.4 feet	See Appendix A for as-built survey of capping area. Based on a review of the as-built survey, the maximum allowed obstruction thickness was achieved within a +/-0.1-foot tolerance, which is reasonable for this type of construction.

Table 7-3. Rock Filter and Rock Capping Design Gradations

Sieve Size	Percent Passing (%)
Rock Filter Design Gradation	
1-1/2 inch	95-100
1 inch	33-55
½ inch	25-45
No. 40	5 (max)
Total Thickness (inches)	4
Rock Capping Design Gradation	
12 inch	100
8 inch	40-60
6 inch	10-25
½ inch	2 (max)
Total Thickness (inches)	16

7.5. Final Inspections and Certifications

Ecology field personnel were on site during all phases of construction activities and accepted the work completed at the site in September 2012. Project activities were completed in general accordance with health and safety requirements contained in the specifications, which required use of HAZWOPER-trained staff. Both GeoEngineers and the contractor prepared and implemented their own health and safety plans; there were no substantial problems or deviations.

7.6. Operations and Maintenance Activities

A formal monitoring plan was finalized by Ecology in September 2013. Monitoring activities include field observations to assess cap integrity and sediment deposition patterns. The plan also requires discrete sampling of surficial material (i.e., deposited on the top of the surface layer of the cap) and of sub-cobble layer material (i.e., deposited sediment not to include any of the cap material). If suitable amounts of material are not present, then a sample is not taken and it is noted in the field book. Sediment/soil samples will be analyzed for arsenic, cadmium, lead, and zinc. Monitoring activities will occur every five years (starting in 2017) or during a year in which a 40,000 cubic foot per second flow event occurs in the Spokane River.

7.7. Contact Information

Table 7-4provides contact information for the major design and remediation contractors and the state oversight lead.

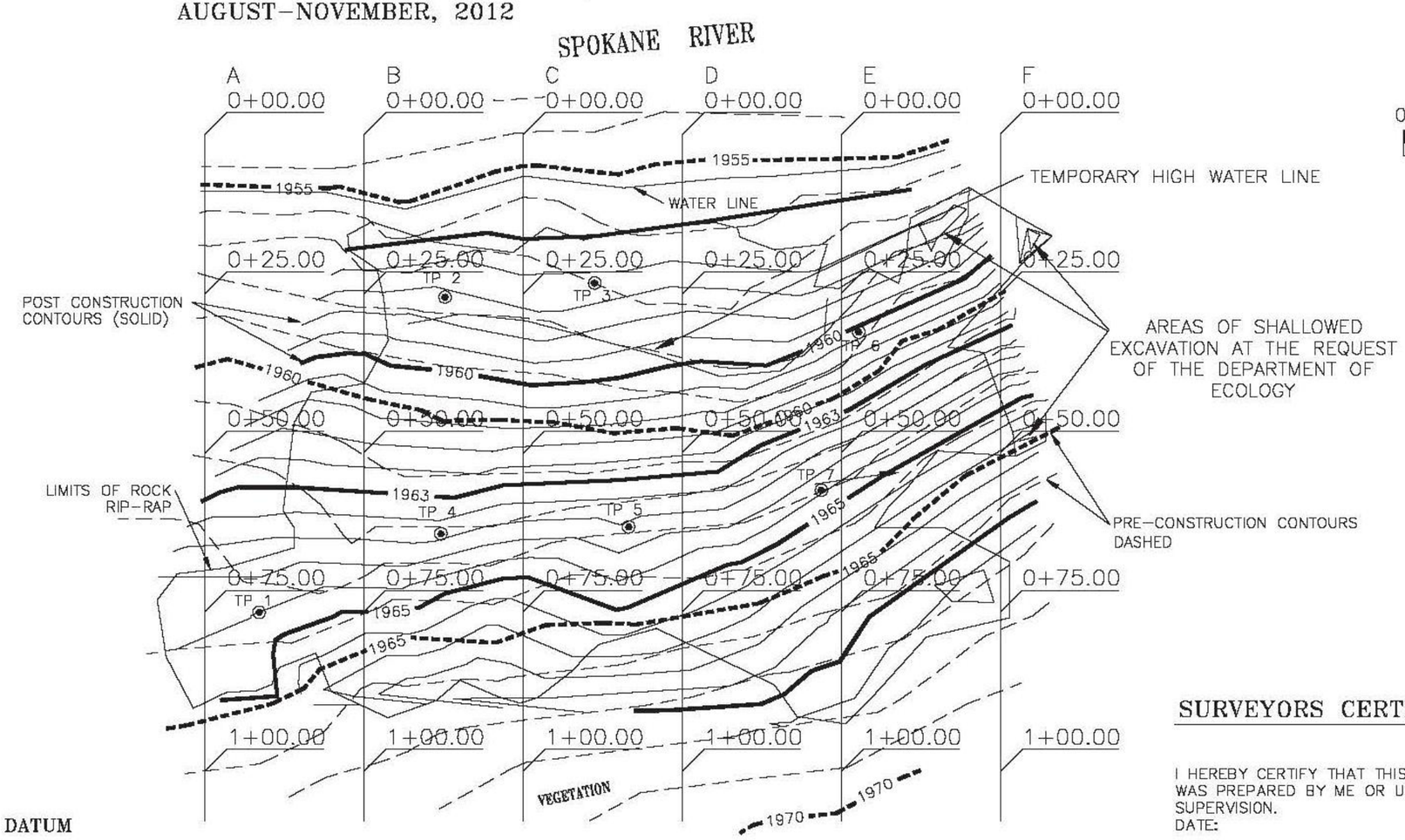
Table 7-4. Contact Information

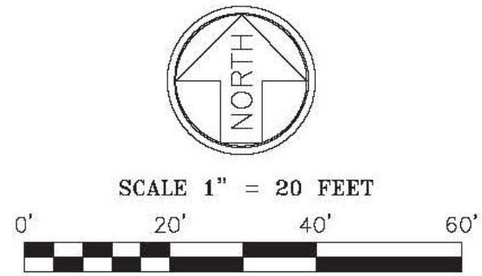
Project Role	Name	Organization	Address
Ecology Oversight	Brendan Dowling	Ecology	Toxics Cleanup Program- Eastern Region Office 4601 North Monroe Street Spokane, WA 99205
Project Engineer	John Haney	GeoEngineers, Inc.	523 East Second Avenue Spokane, WA 99202
Construction Contractor	Eric Risher	Piersol Construction, Inc.	2233 South Garfield Road Airway Heights, WA 99001

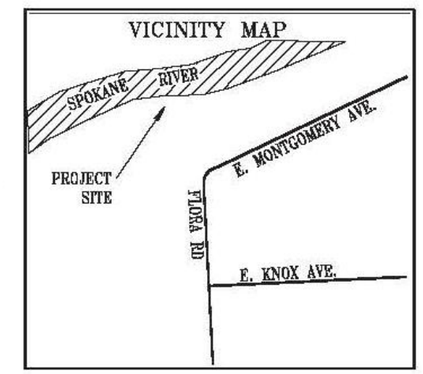
Appendix A- As-Builts

TOPOGRAPHIC SURVEY

FLORA ROAD BEACH, SPOKANE RIVER
LOCATED IN SECTION 7, TOWNSHIP 25 NORTH, RANGE 45 EAST, W.M., SPOKANE VALLEY, WA
AUGUST–NOVEMBER, 2012





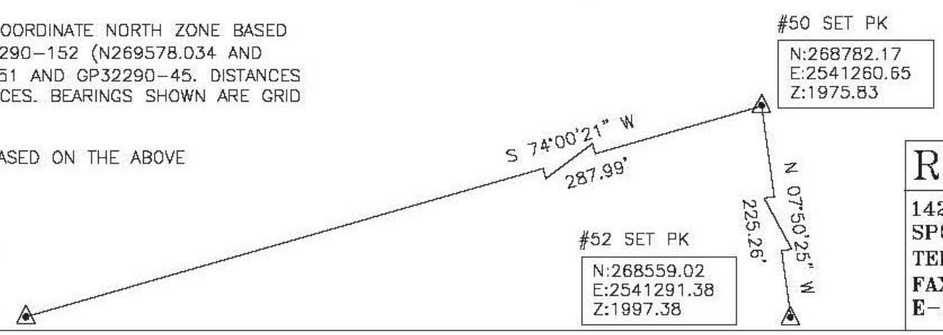


TP = TEST PIT

DATUM

WASHINGTON STATE PLANE COORDINATE NORTH ZONE BASED ON WSDOT MONUMENT GP32290–152 (N269578.034 AND E2541292.782), GP32290–151 AND GP32290–45. DISTANCES SHOWN ARE GROUND DISTANCES. BEARINGS SHOWN ARE GRID BEARINGS.

ELEVATIONS ARE NAVD 88 BASED ON THE ABOVE REFERENCED MONUMENTS.



SURVEYORS CERTIFICATE

I HEREBY CERTIFY THAT THIS TOPOGRAPHIC SURVEY WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION.
DATE:

SIGNATURE: _____

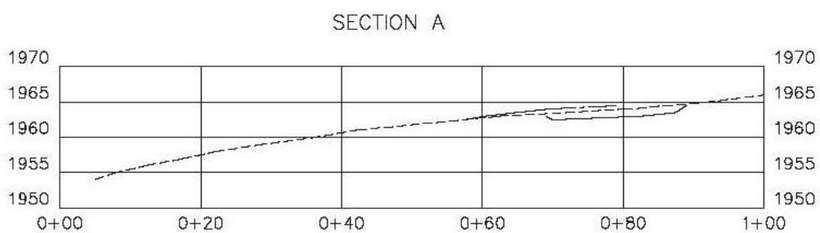
REGISTRATION NO. 33141

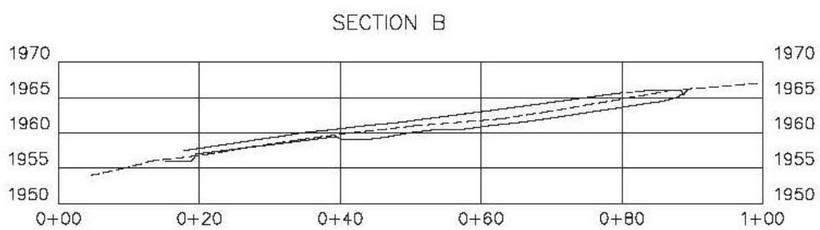
RFK LAND SURVEYING INC.
1420 WEST GARLAND AVENUE
SPOKANE, WA 99205
TEL: (509) 324–7861
FAX: (509) 327–7249
E–MAIL: rfkls@qwestoffice.net

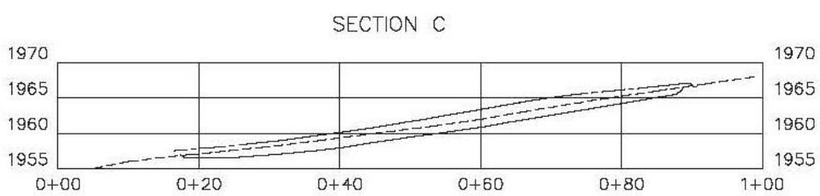
DRAWN	APPROVED	SCALE	PROJECT
RFK	RFK	1"=20'	12–149
DATE	DATE	SHEET	FIELD BOOK
11/16/12	11/16/12	1 OF 2	80

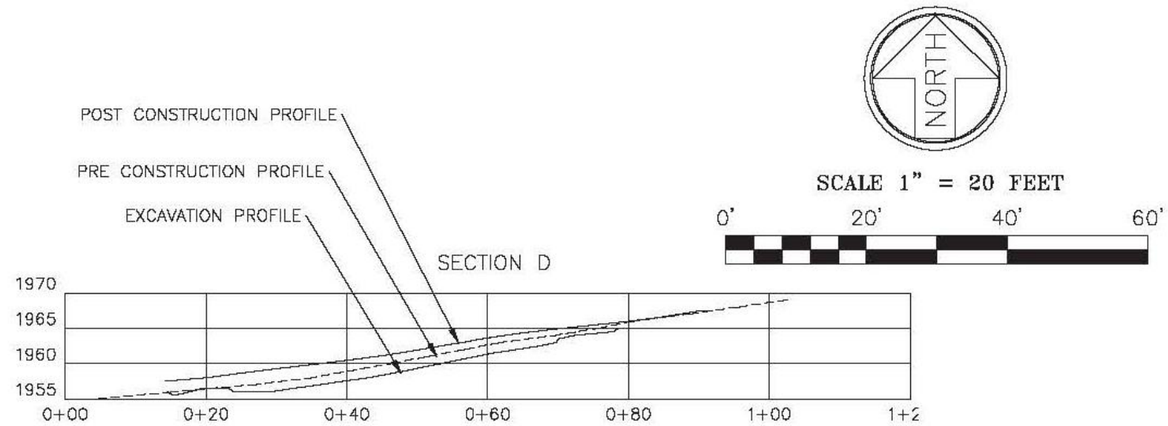
TOPOGRAPHIC SURVEY

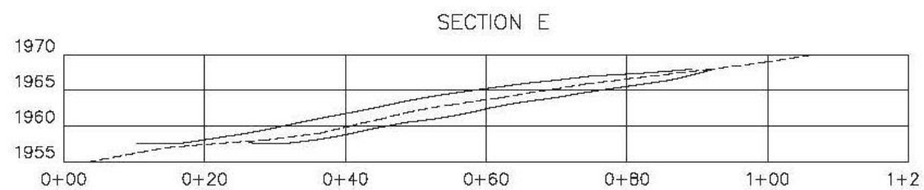
FLORA ROAD BEACH, SPOKANE RIVER
LOCATED IN SECTION 7, TOWNSHIP 25 NORTH, RANGE 45 EAST, W.M., SPOKANE VALLEY, WA
AUGUST–NOVEMBER, 2012

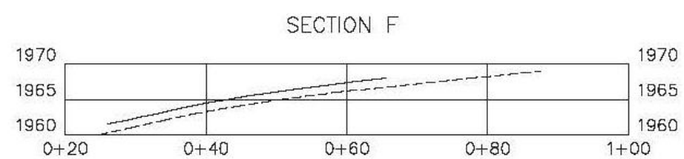












DATUM

WASHINGTON STATE PLANE COORDINATE NORTH ZONE BASED ON WSDOT MONUMENT GP32290–152 (N269578.034 AND E2541292.782), GP32290–151 AND GP32290–45. DISTANCES SHOWN ARE GROUND DISTANCES. BEARINGS SHOWN ARE GRID BEARINGS.

ELEVATIONS ARE NAVD 88 BASED ON THE ABOVE REFERENCED MONUMENTS.

SURVEYORS CERTIFICATE

I HEREBY CERTIFY THAT THIS TOPOGRAPHIC SURVEY WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION.
DATE:

SIGNATURE: _____

REGISTRATION NO. 33141

RFK LAND SURVEYING INC.

1420 WEST GARLAND AVENUE
SPOKANE, WA 99205
TEL: (509) 324–7861
FAX: (509) 327–7249
E–MAIL: rfkls@qwestoffice.net

DRAWN	APPROVED	SCALE	PROJECT
RFK	RFK	1"=20'	12–149
DATE	DATE	SHEET	FIELD BOOK
11/16/12	11/16/12	2 OF 2	80

TOPOGRAPHIC SURVEY

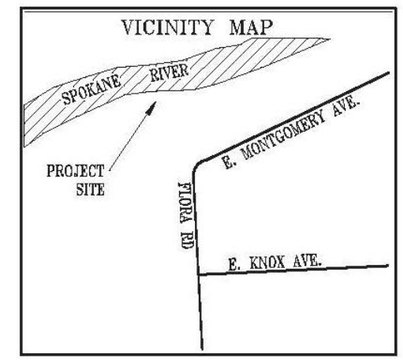
FLORA ROAD BEACH, SPOKANE RIVER
LOCATED IN SECTION 7, TOWNSHIP 25 NORTH,
RANGE 45 EAST, W.M., SPOKANE VALLEY, WA
AUGUST, 2012

Reference: Aerial photo courtesy of Avista. GeoEngineers added the aerial photo to the surveyors contour map.

NORTH

SCALE 1" = 20 FEET

0' 20' 40' 60'



SURVEYORS CERTIFICATE

I HEREBY CERTIFY THAT THIS TOPOGRAPHIC SURVEY WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION.
DATE:

SIGNATURE: _____

REGISTRATION NO. 33141

RUDY F. KITZAN
STATE OF WASHINGTON
33141
REGISTERED
PROFESSIONAL LAND SURVEYOR

RFK LAND SURVEYING INC.

1420 WEST GARLAND AVENUE
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TEL: (509) 324-7861
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DRAWN	APPROVED	SCALE	PROJECT
RFK	RFK	1"=20'	12-149
DATE	DATE	SHEET	FIELD BOOK
08/27/12	08/27/12	1 OF 1	80

Myrtle Point Remedial Action Report

8. Myrtle Point Remedial Action Report

8.1. Background

Myrtle Point is located on the south side of the Spokane River on Washington State Parks recreational land and Washington Department of Natural Resources aquatic lands, approximately 2,600 feet downstream of the Trent Avenue Bridge (river mile 84.7). It is immediately adjacent to the Centennial Trail bicycle and pedestrian path.

Requirements specified in the ROD including RAOs and cleanup levels are described in the Introduction to the Spokane River Beach Cleanup Sites Remedial Action Reports.

The Remedial Action at Myrtle Point consisted of installation of an engineered, hydraulically stable cap. Key elements of the remedial design included:

- Excavation of 84 tons of contaminated sediments for the purpose of achieving the specified cap thickness within the maximum allowed obstruction thickness.
- Placement of four inches of filter rock, followed by eleven inches of capping rock.

The remedial action design was completed in general accordance with the requirements of the ROD, the 90% Design, and EPA's comment on the 90% Design.

8.2. Construction Activities

Pre-construction Sampling

In 2006, nine samples were collected within the site boundaries to further explore and characterize sediment contamination. Three samples exceeded the EPA ROD cleanup level for lead (700 mg/kg).

Bidding/Contractor Selection

Ecology bid the project in August 2012. The construction contract was awarded to Piersol Construction, who implemented the remedial action.

Health and Safety

Project activities were completed in accordance with health and safety requirements contained in the contract specifications, which required use of HAZWOPER-trained staff. Both GeoEngineers and the contractor prepared and implemented their own health and safety plans.

Site Access

Access to the site involved traveling through private (Holcim Inc.) and City of Spokane Valley property. Access, staging, and stockpiling were granted by Holcim Inc.; only access was granted by the City of Spokane Valley. Site access was attained by traveling north from North Cement Road

through the Holcim Inc. property to the Centennial Trail. Traffic control was implemented to route trail users away from construction activities.

Erosion and Sediment Control

Prior to site disturbance, sediment control best management practices (BMPs) were installed around the construction workspace (including within the river) to contain sediment and spoils. The design of detailed BMPs was not within GeoEngineers' design scope of services. GeoEngineers field personnel provided observation services only, recommending and documenting erosion and sediment control measures implemented by the contractor. The contractor installed and maintained appropriate sediment control devices throughout the site in accordance with the applicable local, state, and federal regulations.

Archeological observation

Plateau Archaeological Investigations, LLC (Plateau) provided archeological observation during all excavation activity on site. No Native American or historic-era cultural materials or features were observed during the monitoring.

Cap Area

The cap area was delineated by the Ecology field representative using spray paint. Minor adjustments relative to the cap design limits were made based on field conditions encountered. The contractor's surveyor maintained vertical and horizontal control over the cap area throughout construction.

Pre-excavation Sampling

On August 17, 2012, prior to the remedial action, two composite samples were collected from the full thickness of the proposed excavation. These composite samples were analyzed for total RCRA 8 metals. Both composite samples exceeded the screening level for arsenic. The sample with the greatest concentration of lead was additionally analyzed for leachable lead using the Toxicity Characteristic Leaching Procedure (TCLP) extraction method followed by metals analysis. The detected TCLP lead concentration was 0.172 parts per million (ppm). The excavated material was characterized as solid waste based on these analytical test results.

Excavation and Disposal

Construction activities occurred within the FEMA floodplain and required Construction activities occurred within the FEMA floodplain and required placing filter rock and capping material within a Special Flood Hazard Area located within an "AE Zone" (per FEMA Flood Insurance Rate Map 578D). Because activities were in an "AE Zone" without a regulatory floodway, the project was limited to a 0.1 foot increase in the base flood elevation (BFE). In order to limit the increase of the BFE to 0.1 feet or less, existing sediments were excavated to a depth of about 0.6 feet (7-¼ inches) within the cap area to accommodate the thickness of the rock filter and capping materials.

The excavated material was characterized as solid waste based on chemical analysis. Eighty-four tons of waste material was removed and transported off site for disposal at the RCRA Subtitle D Graham Road Landfill in Spokane Valley Washington.

Post-excavation Sampling

Following soil removal, five soil samples were collected from the excavated limits to document metals concentrations of material remaining in-place beneath the cap. Post-excavation results indicate that two exceeded the EPA cleanup level of 20 mg/kg for arsenic and two samples exceeded the cleanup level for lead (700 mg/kg). The samples with the greatest concentrations of arsenic and lead were additionally analyzed using the Synthetic Precipitation Leaching Procedure (SPLP) extraction followed by total metals analysis; the detected SPLP arsenic concentration was 0.0312 mg/L and the SPLP lead concentration was 1.25 mg/L. Table 8-1 summarizes the post-excavation sampling results. Areas that exceeded cleanup levels were addressed by the cap, which is described in subsequent sections. Five samples exceeded the ROD risk-based background level for arsenic (10 mg/kg), used by Ecology as a cleanup level for arsenic, and drove the placement of the cap over contaminated material.

Table 8-1. Post-excavation (9/5/2012) Sampling Results

Sample ID	Arsenic Concentration (mg/kg)	Lead Concentration (mg/kg)
Myrtle-1	19.3	130
Myrtle-2	18.4	2,020
Myrtle-3	30.4	146
Myrtle-4	20.9	1,300
Myrtle-5	15.2	40.7

Cap Material

Imported material was sourced from Central Pre-Mix Concrete Co. in Spokane Washington. Import material was visually inspected by both Ecology's and GeoEngineers' field personnel prior to placement. Due to the gradation of the contractor supplied material, field blending was completed to achieve specified gradations. For the filter rock, a mixing ratio of approximately 1:3, ¾-inch minus to 1½-inch material was used. For the rock cap gradation, a mixing ratio of approximately 1:8, 1½-inch to 6-inch minus material was used. In addition, a significant number of existing boulders were recovered during excavation, and integrated into the cap. This mixing ratio combined with the use of existing boulders provided gradations in general accordance with the remedial design plans and specifications.

Filter Rock Placement

The project design called for 4 inches of filter rock material. Once excavation was complete, filter rock was placed and compacted in two, 2-inch lifts, each compacted using a vibratory plate compacter with a minimum of three passes.

Capping Material Placement

The project design called for 11 inches of capping material. Once the placement of the filter rock layer was complete, a mini-excavator was used to set and compact the capping material, using the back of the bucket for tamping.

Riparian Vegetation Planting

The project plan included a native riparian vegetation planting plan, consisting of four riparian plant species. Vegetation was planted throughout the site by the contractor per the project design with Ecology oversight on October 25, 2012.

Survey

A post excavation survey was completed on September 5, 2012 to verify adequate excavation depths. Following the placement of capping material, a final survey was completed to verify horizontal and vertical design limits. Survey results indicated the final thickness and capping area were in accordance with the project design plans and specifications.

8.3. Chronology of Events

The chronology of site activities is described in Table 8-2.

Table 8-2. Chronology of Events

Date	Activities
December 2006	Pre-excavation sampling: nine samples were collected within the site boundaries to further explore and characterize sediment contamination
August 2012	Ecology bid the project. Contract was awarded.
August 17, 2012	Pre-excavation sampling: two composite samples were collected from the full thickness of the proposed excavation.
August 31, 2012	Piersol Construction Inc. mobilized to the site.
September 3, 2012	Traffic control divided the trail in half longitudinally to allow for continuous usage during construction. Stockpiles of imported cap rock, filter rock, and boulder material were delivered, inspected and approved. Mixing ratios of 1:8, 1.5 inch material to 8-inch material, and 1:3, 3/4-inch minus to 1.5-inch were recommended to the contractor to achieve design gradations. The capping boundary was delineated with spray paint. Large boulders were removed, separated, and stockpiled for reuse during capping.
September 5, 2012	The required 0.6 feet of native material were excavated and depths were confirmed by the contractor's surveyor. Five samples were collected from the base of excavation (0 to 0.5 feet below the bottom of the excavation) to document existing conditions. Sample locations were logged using an iPad equipped with a global positioning system (GPS) and global information system (GIS) application. Samples were analyzed for total and leachable arsenic and lead.
September 6, 2012	Four inches of rock filter material were placed. The rock filter was placed in two, two-inch lifts; each compacted with three passes of a vibratory plate compactor.
September 7, 2012	Rock capping material was placed and boulders were set into the rock cap. Excavated material was hauled off site and disposed of in the Graham Road Landfill.

Date	Activities
September 8, 2012	The final survey was completed to record as-built horizontal and vertical limits.
September 9, 2012	Ecology accepted the work completed at the site.
September 10, 2012	Additional excavated material was hauled from the site and disposed of in the Graham Road Landfill.
September 11, 2012	The contractor demobilized from the site.
October 25, 2012	The contractor returned to the site and planted riparian species per the project plan.

8.4. Performance Standards and Construction Quality Control

Eighty-four tons of contaminated soil was excavated for the purpose of achieving the specified cap thickness within the maximum allowed obstruction thickness. The soil was disposed of in the Graham Road Landfill. Sixty-nine tons were disposed of on September 7, 2012, and the remaining 15 tons were disposed of on September 10, 2012.

The construction of the remedial cap was completed in general accordance with the remedial design plans and specifications. Table 8-3 summarizes the remedial action performance metrics and field verification of design criteria and as-built conditions.

Table 8-3. Remedial Action Performance Metrics

Performance Metric	Remedial Design Criteria	Comment
Cap Area	3,290 square feet	Final cap area measured by survey as 3,400 square feet (Appendix A).
Excavation	0.6 feet	The excavation depth was not designated for contaminated material removal, but was established as a means to achieve the specified cap thickness within the maximum allowed obstruction thickness.
Filter Thickness	0.33 feet	Confirmed by construction observation.
Filter Material Gradation	See Table 8-4	Confirmed by construction observation.
Cap Thickness	0.92 feet	Confirmed by construction observation.
Cap Material Gradation	See Table 8-4	Confirmed by construction observation.
Vegetation Planting	Per design plans.	Confirmed by construction observation.
Maximum allowed obstruction thickness to prevent 100-year base flood elevation by more than 0.1 feet.	0.65 feet	Based on a review of the as-built survey, the maximum allowed obstruction thickness was achieved within a ±0.1 foot tolerance, which is reasonable for this type of construction (Appendix A).

Table 8-4. Rock Filter and Rock Capping Design Gradations

Sieve Size	Percent passing (%)
Rock Filter Design Gradation	
1.5 inches	95-100
1 inch	33-55
0.5 inches	25-45

Sieve Size	Percent passing (%)
No. 40	5 (max)
Total Thickness	4 inches
Rock Capping Design Gradation	
8 inches	100
4 inches	40-60
2 inches	10-25
0.5 inches	5 (max)
Total Thickness	11 inches

8.5. Final Inspection and Certifications

Ecology field personnel were on site during all phases of construction activities and accepted the work completed at the site on September 9, 2012. Project activities were completed in general accordance with health and safety requirements contained in the specifications, which required use of HAZWOPER-trained staff. Both GeoEngineers and the contractor prepared and implemented their own health and safety plans; there were no substantial problems or deviations.

8.6. Operations and Maintenance Activities

A formal monitoring plan was finalized by Ecology in September 2013. Monitoring activities include field observations to assess cap integrity, sediment deposition patterns, and health of introduced vegetation. The plan also requires discrete sampling of surficial material (i.e., deposited on the top of the surface layer of the cap) and of sub-cobble layer material (i.e., deposited sediment not to include any of the cap material). If suitable amounts of material are not present, then a sample is not taken and it is noted in the field book. Sediment/soil samples will be analyzed for arsenic, cadmium, lead, and zinc. Monitoring activities will occur every five years (starting in 2017) or during a year in which a 40,000 cubic foot per second flow event occurs in the Spokane River.

8.7. Contact Information

Table 8-5 provides contact information for the major design and remediation contractors and the state oversight lead.

Table 8-5. Contact Information

Project Role	Name	Organization	Address
Ecology Oversight	Dave George	Ecology	Toxics Cleanup Program- Eastern Region Office 4601 North Monroe Street Spokane, WA 99205
Project Engineer	John Haney	GeoEngineers, Inc.	523 East Second Avenue Spokane, WA 99202
Construction Contractor	Eric Risher	Piersol Construction, Inc.	2233 South Garfield Road Airway Heights, WA 99001

Appendix A- As-Builts

LEGEND

Constructed Cap Area (per as-built survey)

Proposed Cap Area (per construction plans)

N
W E
S

25 0 25
Feet

Reference: Aerial image obtained from Google Earth Pro.

Revision No:	Date:	Description:	Initials:	Designed: JJF
				Drawn: MGF
				Checked: JRS
				Date: 02/07/12
				Project No: 0504-072-00

Spokane River-Myrtle Point
Spokane Valley, Washington
Washington State
Department of Ecology

GEOENGINEERS
523 East Second Avenue
Spokane, Washington 99202

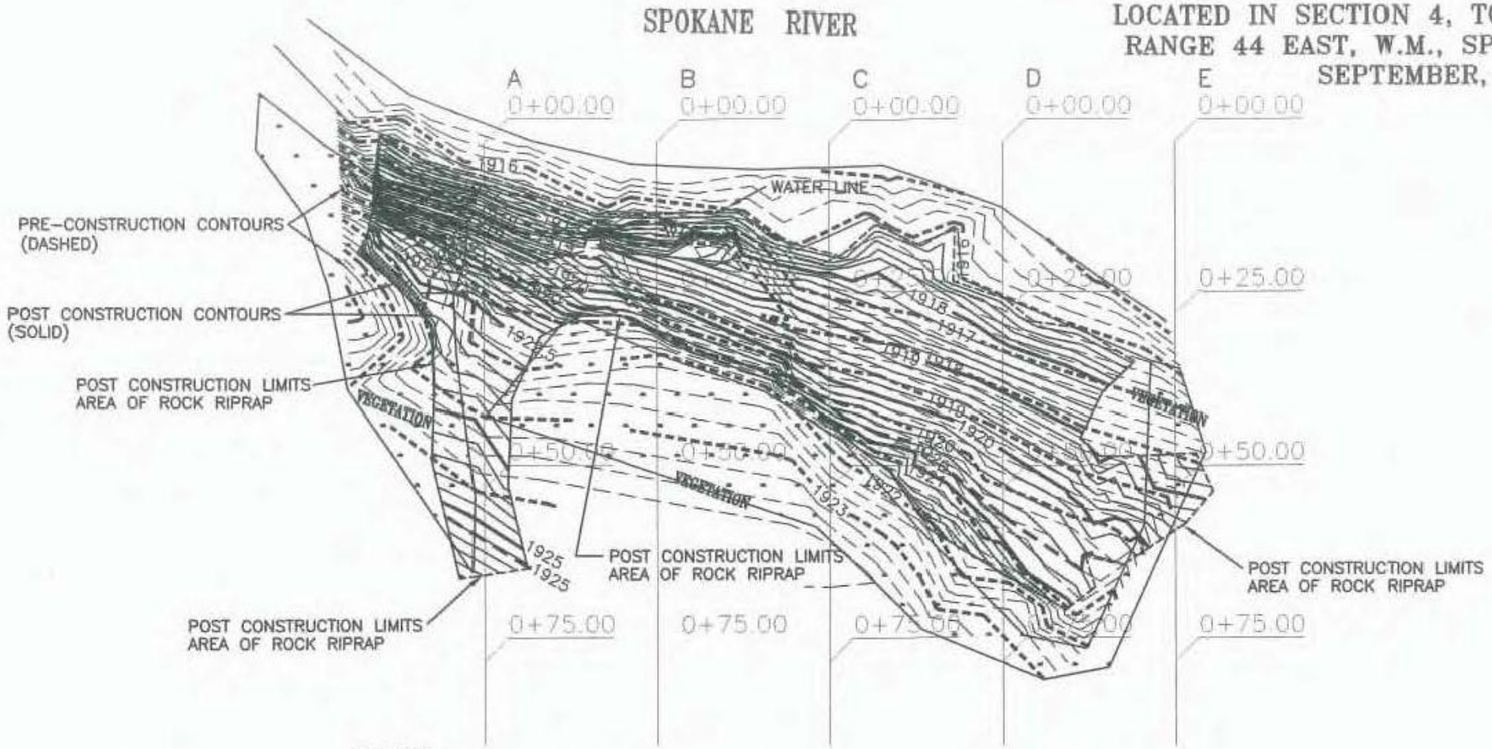
As-built Capping Area Site Plan

Myrtle Point Beach Cleanup
Construction Completion Report

C:\Users\jjarman\Documents\Projects\Spokane River Beach Cleanup\Compilation Report\0504072200-MPdesign33.dwg\TAB:SHEET 3 modified on Feb 19, 2013 - 4:20pm JRH : MGF

TOPOGRAPHIC SURVEY

MYRTLE POINT BEACH AS BUILT, SPOKANE RIVER
LOCATED IN SECTION 4, TOWNSHIP 25 NORTH,
RANGE 44 EAST, W.M., SPOKANE VALLEY, WA
SEPTEMBER, 2012



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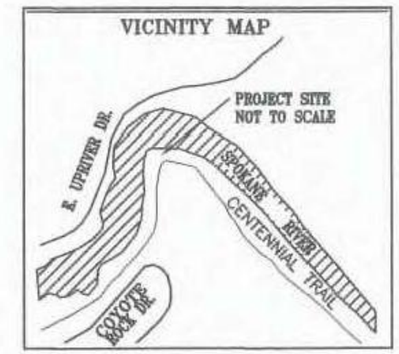
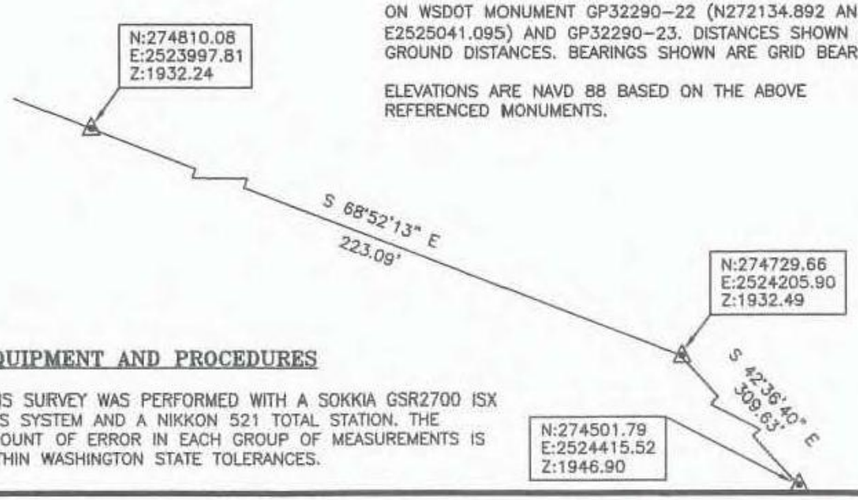


DATUM

WASHINGTON STATE PLANE COORDINATE NORTH ZONE BASED ON WSDOT MONUMENT GP32290-22 (N272134.892 AND E2525041.095) AND GP32290-23. DISTANCES SHOWN ARE GROUND DISTANCES. BEARINGS SHOWN ARE GRID BEARINGS.

ELEVATIONS ARE NAVD 88 BASED ON THE ABOVE REFERENCED MONUMENTS.



EQUIPMENT AND PROCEDURES

THIS SURVEY WAS PERFORMED WITH A SOKKIA GSR2700 ISX GPS SYSTEM AND A NIKKON 521 TOTAL STATION. THE AMOUNT OF ERROR IN EACH GROUP OF MEASUREMENTS IS WITHIN WASHINGTON STATE TOLERANCES.

SURVEYORS CERTIFICATE

I HEREBY CERTIFY THAT THIS TOPOGRAPHIC SURVEY WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION.

DATE:

SIGNATURE:

REGISTRATION NO. 33141

RUDY F. KITZAN
STATE OF WASHINGTON
33141
REGISTERED PROFESSIONAL LAND SURVEYOR
11-19-12

RFK LAND SURVEYING INC.

1420 WEST GARLAND AVENUE
SPOKANE, WA 99205
TEL: (509) 324-7861
FAX: (509) 327-7249
E-MAIL: lsrfkitzan@qwestoffice.net

DRAWN	APPROVED	SCALE	PROJECT
RFK	RFK	1"=20'	12-149
DATE	DATE	SHEET	FIELD BOOK
11/19/12	11/19/12	1 OF 2	80

TOPOGRAPHIC SURVEY

MYRTLE POINT BEACH AS BUILT, SPOKANE RIVER
LOCATED IN SECTION 4, TOWNSHIP 25 NORTH,
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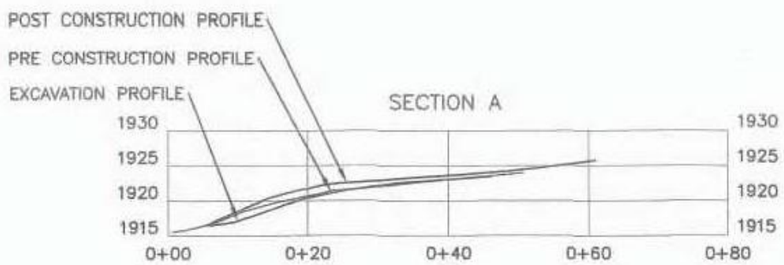

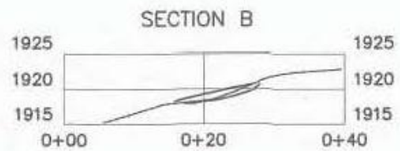

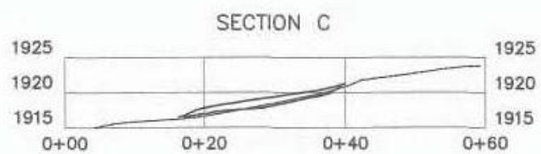

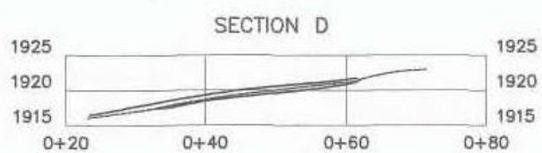

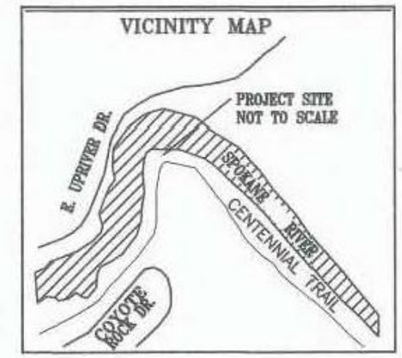

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DRAWN	APPROVED	SCALE	PROJECT
RFK	RFK	1"=20'	12-149
DATE	DATE	SHEET	FIELD BOOK
11/19/12	11/19/12	2 OF 2	80

TOPOGRAPHIC SURVEY

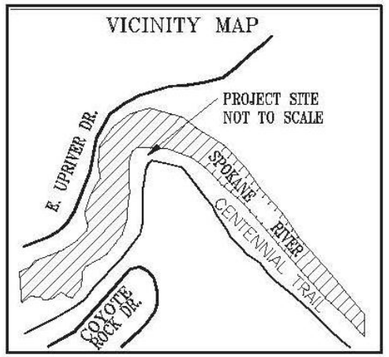
MYRTLE POINT BEACH AS BUILT, SPOKANE RIVER
LOCATED IN SECTION 4, TOWNSHIP 25 NORTH,
RANGE 44 EAST, W.M., SPOKANE VALLEY, WA
SEPTEMBER, 2012

NORTH

SCALE 1" = 20 FEET

0' 20' 40' 60'

VICINITY MAP



DATUM

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ELEVATIONS ARE NAVD 88 BASED ON THE ABOVE REFERENCED MONUMENTS.

SURVEYORS CERTIFICATE

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DATE:

SIGNATURE: _____

REGISTRATION NO. 33141

RUDY F. KITZAN
STATE OF WASHINGTON
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REGISTERED
PROFESSIONAL LAND SURVEYOR

Reference: Aerial photo courtesy of Avista. GeoEngineers added the aerial photo to the surveyors contour map.

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DRAWN	APPROVED	SCALE	PROJECT
RFK	RFK	1"=20'	12-149
DATE	DATE	SHEET	FIELD BOOK
09/25/12	09/25/12	1 OF 1	80

Islands Lagoon Remedial Action Report

9. Islands Lagoon Remedial Action Report

9.1. Background

Islands Lagoon is located on Washington State Parks recreational land and Washington Department of Natural Resources aquatic lands, being on the south side of the Spokane River, approximately 4,600 feet downstream of the Trent Avenue Bridge (river mile 84.7). It is immediately adjacent to the Centennial Trail bicycle and pedestrian path and approximately 2,000 feet downstream of the Myrtle Point site location.

The Remedial Action at Islands Lagoon consisted of installation of an engineered, hydraulically stable cap. Key elements of the remedial design included:

- Placement of a cap consisting of four inches of filter rock, followed by eight inches of rock capping, and 4 inches of sand filler.

The remedial action design was completed in general accordance with the requirements of the ROD, the 90% Design, and EPA's comments on the 90% Design.

9.2. Construction Activities

Construction activities occurred within the FEMA floodplain and required placing boulders, filter rock, and capping material within a Special Flood Hazard Area located within an "AE Zone" (per FEMA Flood Insurance Rate Map 578D). Because activities were in an "AE Zone" without a regulatory floodway, the project was limited to a 0.1-foot increase in the base flood elevation (BFE). The cap and filter material were installed at a range of approximate total thicknesses between 0.8 and 0.9 feet. The designed/installed thickness of the cap did not require excavation of existing contaminated sediments to meet the 0.1-foot rise in BFE limitation.

Pre-construction Sampling

In 2006, eleven samples were collected within the Project Site boundaries to characterize sediment contamination. Pre-capping results indicate that one lead sample exceeded the ROD cleanup level for lead (700 mg/kg) for the Spokane River project sites in Washington; only one sample exceeded the EPA cleanup level for arsenic (20 mg/kg). Prior to the remedial action (August 17, 2012), two composite samples were collected within the proposed capped area. These composite samples were analyzed for total Resource Conservation and Recovery Act (RCRA) 8 metals, and the sample with the greatest concentration of lead also was analyzed for leachable lead using the Toxicity Characteristic Leaching Procedure (TCLP) extraction method followed by total metals analysis. The detected TCLP lead concentration was 0.506 milligrams per liter (mg/l).

Bidding/Contractor Selection

Ecology bid the project in August 2012. The construction contract was awarded to Piersol Construction, who implemented the remedial action.

Health and Safety

Project activities were completed in accordance with health and safety requirements contained in the contract specifications, which required use of HAZWOPER-trained staff. Both GeoEngineers and the contractor prepared and implemented their own health and safety plans.

Site Access

Access to the site involved traveling through both private [Holcim (US) Inc.] and City of Spokane Valley property. Holcim (US) Inc. granted access, staging, and stockpiling permissions. Access only was granted by the City of Spokane Valley. The Project Site was accessed by traveling north from North Cement Road through the Holcim (US) Inc. property to the Centennial Trail. Traffic control was implemented to route trail users away from construction activities.

Erosion and Sediment Control

Prior to site disturbance, sediment control best management practices (BMPs) were installed around the construction workspace (including within the river) to contain sediment and spoils. The design of detailed BMPs was not within GeoEngineers' design scope of services. GeoEngineers field personnel provided observation services only, recommending and documenting erosion and sediment control measures implemented by the contractor. The contractor installed and maintained appropriate sediment control devices throughout the site in accordance with the applicable local, state, and federal regulations.

Pre-cap Sampling

On August 31, 2012, before capping of existing sediments, nine soil samples were collected from within the site limits to document metals concentrations of material remaining in-place beneath the cap. Pre-cap results indicate that three exceeded the EPA's cleanup level of 20 mg/kg for arsenic and two samples exceeded the established EPA ROD cleanup level for lead (700 mg/kg). The samples with the greatest concentrations of arsenic and lead were also analyzed using the Synthetic Precipitation Leaching Procedure (SPLP) extraction followed by total metals analysis. The detected SPLP arsenic concentration was 0.0416 mg/l and the SPLP lead concentration was 0.311 mg/l.

Cap Material

Imported material was sourced from Central Pre-Mix Concrete Co. in Spokane Washington. Both Ecology and GeoEngineers' field personnel observed import material prior to placement. Piersol blended imported material in the field to achieve specified gradations. Piersol used a mixing ratio of approximately 1:3, ¾-inch-minus to 1½-inch for the filter rock material. Piersol used a mixing ratio of approximately 1:8, 1½-inch to 6-inch-minus material for the rock cap gradation. In addition, a retaining structure consisting of boulders approximately 2 ½ to 3 ½ feet in diameter was placed on a near-vertical portion of the beach that was subject to erosion. The structure consisted of a boulder toe placed on a boulder footer. Capping materials were then placed behind the retaining structure.

Filter Rock Placement

The project design specified 4 inches of filter rock material. Piersol placed filter rock and compacted it in two, 2-inch lifts; each compacted using a vibratory plate compacter with a minimum of three passes.

Capping Material Placement

The project design specified 8 inches of rock capping material with 4 inches of sand filler placed over top. Once the placement of the filter rock layer was complete, a mini-excavator was used to set and compact the capping material, using the back of the bucket for tamping. Note the imported material identified as 2- to 4-inch rock on the truck tickets was actually 4- to 8-inch rock as observed by Ecology and GeoEngineers field personnel.

Survey

RFK Surveying completed a post excavation survey on September 5, 2012 to document excavation depths. Following the placement of capping material, RFK Surveying completed a final survey to document horizontal and vertical constructed limits. Survey results indicated the final thickness and capping area were in general accordance with the project design plans and specifications.

9.3. Chronology of Events

The chronology of site activities is described inTable 9-1.

Table 9-1. Chronology of Events

Date	Activities
2006	Pre-construction sampling: eleven samples were collected within the Project Site boundaries to characterize sediment contamination.
August 17, 2012	Two composite samples were collected within the proposed cap area.
August 31, 2012	GeoEngineers collected nine samples prior to placing cap material to document existing conditions. Sample locations were logged using an iPad equipped with a global positioning system (GPS) and global information system (GIS) application. Samples were analyzed for total and leachable arsenic and lead
September 3, 2012	Peirsol Construction In.c mobilized to the site. Traffic control divided the trail in half longitudinally to allow continuous usage during construction. Stockpiles of imported cap rock, filter rock, and boulder material were delivered, observed, and approved. Mixing ratios of 1:8, 1-1/2-inch material to 8-inch material and 1:3, 3/4-inch-minus to 1 1/2-inch were recommended to the contractor to achive design gradations. The capping boundry was delineated with spray paint. Large boulders were removed, separated, and stockpiled for reuse during capping.
September 6, 2012	Two additional inches of rock filter material were placed and compacted. Rock filler was placed in two inch lifts; each compacted with three passes of a vibratory plate compactor. Eight inches of rock capping material were placed and compacted with a vibratory plate compactor.
September 7, 2012	Sand filler placement and compaction complete.
September 11, 2012	The contractor demobilized from the site.

Date	Activities
September 25, 2012	The final survey was completed to record as-built horizontal and vertical limits.

9.4. Performance Standards and Construction Quality Control

The construction of the remedial cap was completed in general accordance with the remedial design plans and specifications. The project design report identified the following performance metrics for the work which are summarized in Table 9-2.

Table 9-2. Remedial Action Performance Metrics

Performance Metric	Remedial Design Criteria	Comment
Cap Area	9,743 square feet	Final cap to meet the general intent of the project design. See Appendix A.
Excavation	0.0 feet	See Appendix A for as-built survey of capping area. Excavation was not necessary to achieve the specified cap thickness within the maximum allowed obstruction thickness (see below).
Filter Thickness	0.33 feet	Confirmed by construction observation.
Filter Material Gradation	See Table 9-3	Confirmed by construction observation.
Cap Thickness	0.66 feet	Confirmed by construction observation.
Cap Material Gradation	See Table 9-3	Confirmed by construction observation.
Sand Filter	0.33 Feet	Confirmed by construction observation.
Maximum allowed obstruction thickness to prevent 100-year base flood elevation by more than 0.1 feet.	1.15 feet	See Appendix A for as-built survey of capping area. Based on a review of the as-built survey, the maximum allowed obstruction thickness was achieved within a +/-0.1-foot tolerance, which is reasonable for this type of construction.

Table 9-3. Rock Filter and Rock Capping Design Gradations

Sieve Size	Percent Passing
Rock Filter Design Gradation	
1-1/2 inch	95-100
1 inch	33-55
½ inch	25-45
No. 40	5 (max)
Total Thickness (inches)	4
Rock Capping Design Gradation	
6 inch	100
4 inch	40-60

2 inch	10-25
½ inch	5 (max)
Total Thickness (inches)	8

9.5. Final Inspection and Certifications

Ecology field personnel were on site during all phases of construction activities, and accepted the work completed at the site in September 2012.

9.6. Operations and Maintenance Activities

A formal monitoring plan was finalized by Ecology in September 2013. Monitoring activities include field observations to assess cap integrity and sediment deposition patterns. The plan also requires discrete sampling of surficial material (i.e., deposited on the top of the surface layer of the cap) and of sub-cobble layer material (i.e., deposited sediment not to include any of the cap material). If suitable amounts of material are not present, then a sample is not taken and it is noted in the field book. Sediment/soil samples will be analyzed for arsenic, cadmium, lead, and zinc. Monitoring activities will occur every five years (starting in 2017) or during a year in which a 40,000 cubic foot per second flow event occurs in the Spokane River.

9.7. Contact Information

Table 9-4 provides contact information for the major design and remediation contractors and the state oversight lead.

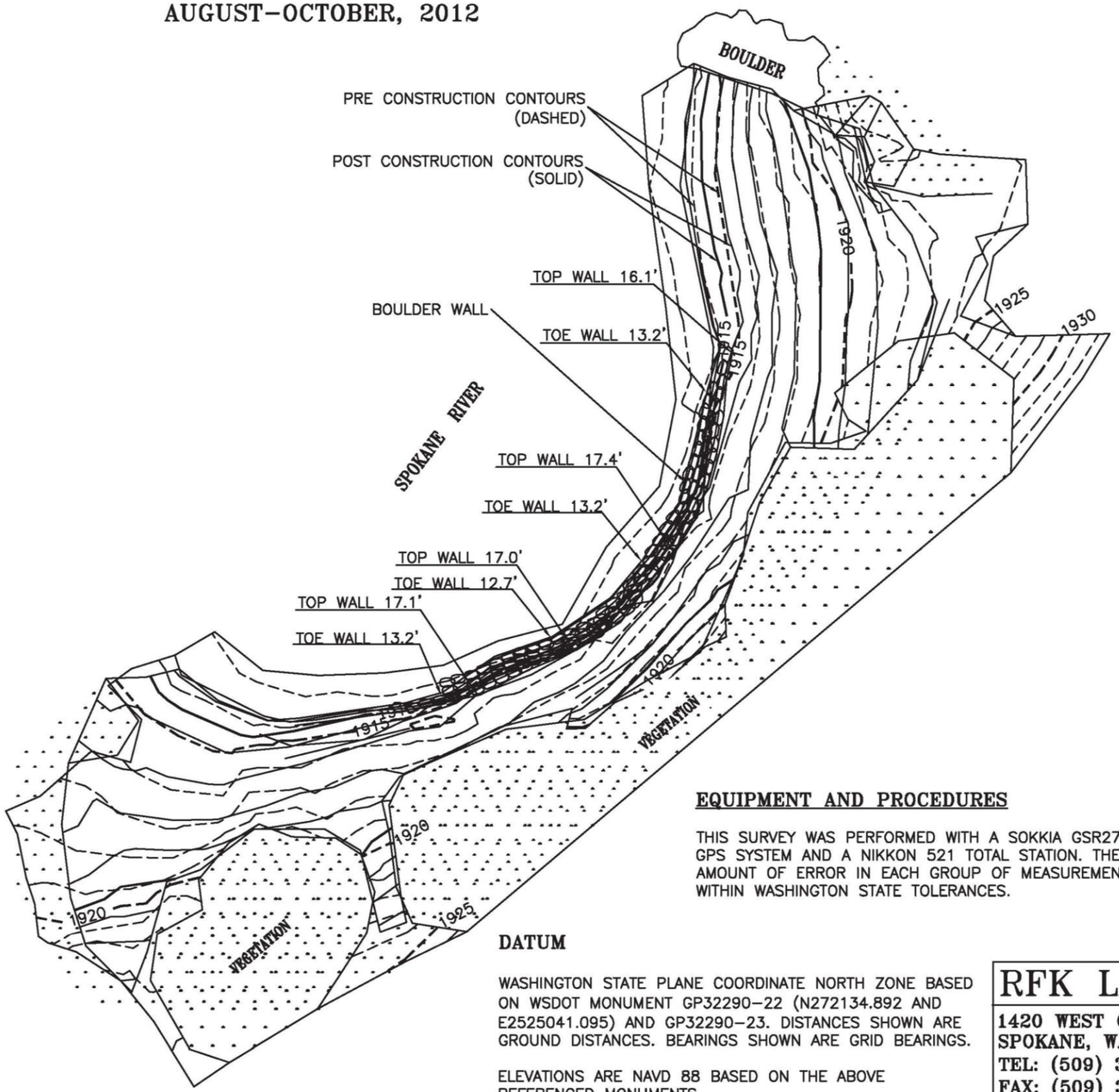
Table 9-4. Contact Information

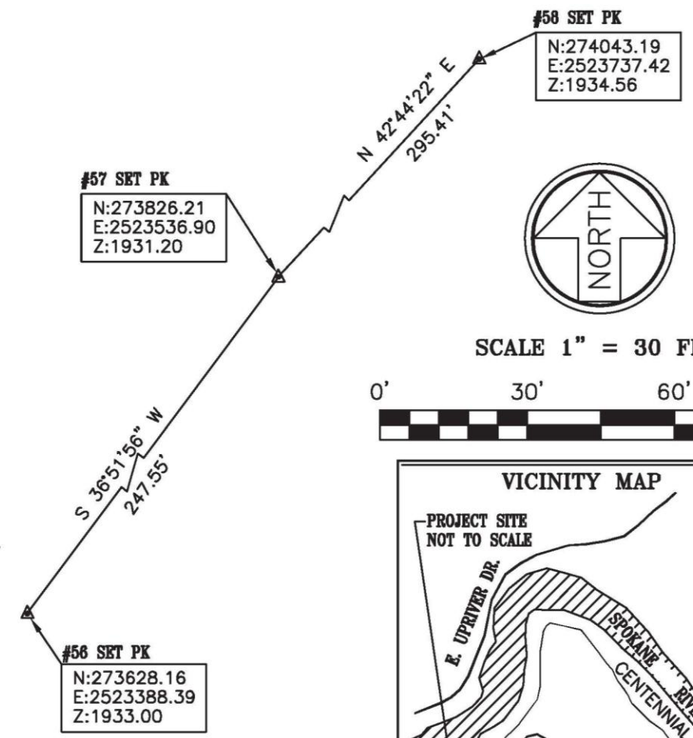
Project Role	Name	Organization	Address
Ecology Oversight	Brendan Dowling	Ecology	Toxics Cleanup Program- Eastern Region Office 4601 North Monroe Street Spokane, WA 99205
Project Engineer	John Haney	GeoEngineers, Inc.	523 East Second Avenue Spokane, WA 99202
Construction Contractor	Eric Risher	Piersol Construction, Inc.	2233 South Garfield Road Airway Heights, WA 99001

Appendix A- As-Builts

TOPOGRAPHIC SURVEY

ISLANDS LAGOON, SPOKANE RIVER
LOCATED IN SECTION 4, TOWNSHIP 25 NORTH, RANGE 44 EAST, W.M., SPOKANE VALLEY, WA
AUGUST–OCTOBER, 2012





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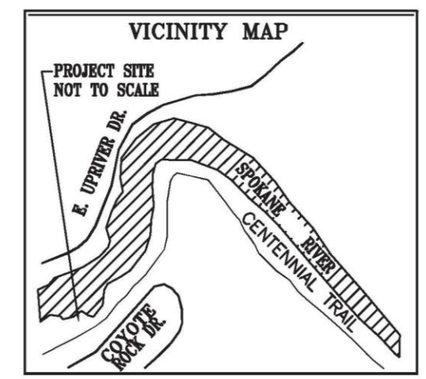

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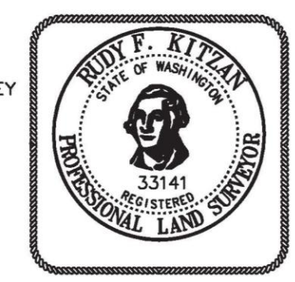

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DRAWN	APPROVED	SCALE	PROJECT
RFK	RFK	1"=30'	12–149
DATE	DATE	SHEET	FIELD BOOK
11/19/12	11/19/12	1 OF 1	80

TOPOGRAPHIC SURVEY

ISLANDS LAGOON AS BUILT, SPOKANE RIVER
LOCATED IN SECTION 4, TOWNSHIP 25 NORTH, RANGE 44 EAST, W.M., SPOKANE VALLEY, WA
SEPTEMBER, 2012

SCALE 1" = 30 FEET

0' 30' 60' 90'

DATUM

WASHINGTON STATE PLANE COORDINATE NORTH ZONE, BASED ON WSDOT MONUMENT GP32290-19 (N:278[illegible] E2525041.095) AND GP32290-23. DISTANCES SHOWN ARE GROUND DISTANCES. BEARINGS SHOWN ARE GRID BEARINGS.

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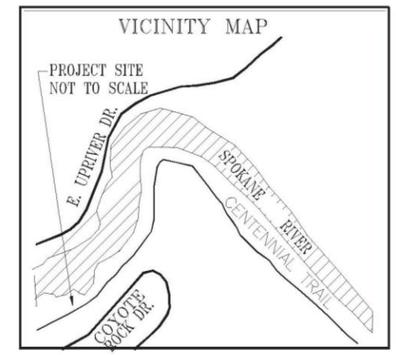
VICINITY MAP



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DRAWN	APPROVED	SCALE	PROJECT
RFK	RFK	1"=30'	12-149
DATE	DATE	SHEET	FIELD BOOK
09/25/12	09/25/12	1 OF 1	80

Barker Road South Remedial Action Report

10. Barker Road South Remedial Action Report

10.1. Background

The Barker Road South Site is located on Washington State Parks recreational land and Department of Natural Resources aquatic lands, being on the south side of the Spokane River, upstream of the Barker Road Bridge (river mile 90.4). It is immediately adjacent to the Centennial Trail bicycle and pedestrian path.

The Remedial Action at the Barker Road South consisted of institutional controls. Specifically, a sign announcing the closure of the beach area was installed.

10.2. Construction Activities

Pre-Remedial Action Sampling

In 2006, five samples were collected within the Site boundaries to define the nature and exent of arsenic and lead contamination on and directly adjacent to the area associated with recreational use. The laboratory analysis results are shown in Table 10-1. No samples exceeded the EPA cleanup level for arsenic (20 mg/kg). The lead cleanup level (700 mg/kg) was not exceeded in any of the samples.

Table 10-1. Analytical results of pre-remedial action sampling in 2006

Sample	Arsenic Concentration (mg/kg)	Lead Concentration (mg/kg)
1	16.3	74.1
2	13.2	27.1
3	11.4	58.4
4	10.8	32.7
5	13.0	59.2

Although the EPA cleanup levels were not exceeded at this site, Ecology decided to implement actions to reduce recreational exposure. Due to the nature of access (steep slopes and heavy vegetation) for both recreational and cleanup actions and the limited recreational use of the area, Ecology determined that signage was the most appropriate and effective way to limit recreational human exposure to sediments. A photograph of the sign and its location are shown in Appendix A.

10.3. Chronology of Events

The chronology of site activities is described in Table 10-2.

Table 10-2. Chronology of Events

Date	Activities
August 2006	Five samples were collected within the Project Site boundaries to characterize sediment contamination.
Spring 2014	Signage was installed announcing closure of the beach.

10.4. Performance Standards and Construction Quality Control

There were no performance standards or construction quality control for the remedial action.

10.5. Final Inspection and Certifications

The sign was installed by Washington State Parks in Spring 2014, and Ecology accepted the work as performed.

10.6. Operations and Maintenance Activities

No operations and maintenance activities are anticipated.

10.7. Contact Information

Table 10-3 provides contact information for the state oversight lead.

Table 10-3. Contact Information

Project Role	Name	Organization	Address
Ecology Oversight	Brendan Dowling	Ecology	Toxics Cleanup Program- Eastern Region Office 4601 North Monroe Street Spokane, WA 99205

Appendix A- Sign and Sign Location

BARKER ROAD SOUTH
ACCESS CLOSED

Beach contains heavy metals contamination washed downstream from historic mining practices in the Coeur d'Alene Basin.

For Your Health and Safety

- Do not use this beach or sloped area.
- Do not party, swim, boat, or recreate here.
- For your safety use another beach area.
  (The beach directly across the river is an option. It is one of eight Spokane River beaches Ecology cleaned up as part of EPA's Record of Decision for the Coeur d'Alene Basin)

Questions: Call WA State Department of Ecology, Toxics Cleanup Program at 509/329-3410

For Details Visit Ecology's website:
https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=11588

DEPARTMENT OF ECOLOGY
State of Washington

SPANISH VERSION

BARKER ROAD SUR
ACESO PROHIBIDO

La playa contiene contaminación de metales pesados que vinieron aguas abajo de las prácticas históricas de la minería en la Cuenca de Coeur d'Alene.

Para asegurar su salud y seguridad:

- Se prohibe usar esta playa o el área con pendiente.
- Se prohibe recrear, nadar, andar de lancha y hacer fiesta.
- Para su seguridad, se debe usar otra playa.
  (*La playa directamente al otro lado del río es una opción. Es uno de las ocho playas del Río Spokane que fueron limpiadas por Ecología como parte del Record de Decisión del EPA para la Cuenca de Coeur d'Alene.)*

¿Tiene preguntas? Llame al Programa de Limpieza de Sustancias Tóxicas, Departamento de Ecología del Estado de Washington,
al número telefónico: 509/329-3410

Para obtener detalles: Visite el sitio del internet de Ecología:
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RUSSIAN VERSION

ПОДЪЕЗД ОТ ДОРОГИ BARKER С ЮЖНОГО НАПРАВЛЕНИЯ ЗАКРЫТ!

Пляж загрязнен выбросами тяжелых металлов, принесенных течением реки из горнодобывающих предприятий, исторически находившихся в бассейне озера Кордельен.

Для вашей безопасности и здоровья

- Не пользуйтесь этим пляжем и спуском к реке.
- Не рекомендуется плавать, кататься на лодке, устраивать пикники или отдыхать здесь.
- Для вашей безопасности пользуйтесь другим пляжем
  (Например, пляж, прямо напротив, на другой стороне реки, который является одним из 8-ми пляжей реки Спокейн, очищенных Отделом Экологии на основании решения об очистке бассейна Кордельен, принятого Агентством защиты окружающей среды (EPA)).

Вопросы: Звоните в Отдел экологии штата Вашингтон, Программа очистки токсических отходов, по телефону 509/329-3410

Дополнительную информацию можно получить на вебсайте Отдела экологии:
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SIGN
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N Barker Rd

Donkey Island Remedial Action Report

11. Donkey Island Remedial Action Report

11.1. Background

The Donkey Island Shoreline Sediment Site is located on the north side of the Spokane River about ½ mile downstream of the Centennial Footbridge.

A no-action decision was made based on the results of sampling of the riverward beach area in late 2005.

11.2. Construction Activities

In December 2005, 32 samples were collected and analyzed for lead and arsenic by x-ray fluorescence (XRF). Twelve subsamples were analyzed in at the Manchester Environmental Laboratory using EPA SW846 – 3050B and EPA Method 200.8. The results of the analyses are presented in Table 11-1.

Table 11-1. Analytical results of 2005 sampling

Sample	Arsenic (mg/kg)		Lead (mg/kg)	
	Laboratory	XRF	Laboratory	XRF
1A	6.65	≤22	30	41
1B	--	≤24	--	48
1C	9.12	≤33	263	180
1D	--	≤34	--	170
1E	--	≤40	--	317
1F	14.3	≤48	694	525
1G	--	≤42	--	385
1H	--	≤23	--	35
1I	6.86	≤24	20	40
1J	--	≤25	--	34
1K	7.59	≤25	62	63
1L	--	≤26	--	76
1M	--	≤22	--	28
2A	--	≤25	--	54
2B	--	≤27	--	82
2C	9.79	≤26	103	63
2D	--	≤25	--	74
2E	7.24	≤25	59	72
2F	--	≤30	--	118
2G	8.38	≤31	179	172
2H	--	≤29	--	127
2I	--	≤33	--	227
2J	13	≤46	668	534
2K	--	≤30	--	137
2L	13.8	≤34	219	237

Sample	Arsenic (mg/kg)		Lead (mg/kg)	
	Laboratory	XRF	Laboratory	XRF
2M	--	≤25	--	72
3A	--	≤23	--	29
3B	8.76	≤25	55	62
3C	--	≤25	--	63
4A	--	≤24	--	51
4B	10.1	≤25	47	55
4C	--	≤25	--	61

Generally, the results indicated that lead concentrations within the site boundaries were below the ROD cleanup level for lead (700 mg/kg) and EPA's cleanup level of 20 mg/kg for arsenic. It was determined that no further action would be necessary due to the low concentrations observed during the sampling event. Metals co-located with polychlorinated biphenyls (PCBs) at Donkey Island were removed and clean material was backfilled as a part of the Upriver Dam PCB cleanup.

11.3. Chronology of Events

The chronology of site events is described in Table 11-2.

Table 11-2. Chronology of Events

Date	Activities
December 2005	Samples were collected within the Project Site boundaries to characterize sediment contamination.

11.4. Performance Standards and Construction Quality Control

There were no performance standards or construction quality control for the remedial action.

11.5. Final Inspections and Certifications

No final inspections or certifications were required for the remedial action.

11.6. Operations and Maintenance Activities

No operations and maintenance activities are anticipated.

11.7. Contact Information

Table 11-3 provides contact information for the state oversight lead.

Table 11-3. Contact Information

Project Role	Name	Organization	Address
Ecology Oversight	Zach Hedgpeth	Ecology	Toxics Cleanup Program- Eastern Region Office 4601 North Monroe Street Spokane, WA 99205

12. Upriver Dam Remedial Action Report

12.1. Background

The upstream end of the Upriver Dam impoundment, at approximately river mile 85 near Myrtle Point,, is approximately 17 miles downstream of the Post Falls Dam at river mile 101.7. Below Myrtle Point, within the dam impoundment, river velocity slows considerably, particularly during seasonal low flow conditions and within the relatively wide and deep reach of the river immediately upstream of the Upriver Dam at river mile 79.8. Settling of fine-grained sediments and organic matter occurs within such lower energy environments resulting in the accumulation of sediments and sediment-bound contaminants, including PCBs from point and non-point sources and metals from upstream mining wastes.

EPA's Coeur d'Alene Basin Remedial Investigation/Feasibility Study focused on heavy metal contamination in the Basin and did not addressPCB-contaminated sediment deposits located upstream of the Spokane River Upriver Dam. PCBs are a separate issue from the mining-related contamination addressed in the Coeur d'Alene OU3 ROD. Ecology, as the lead agency responsible for overseeing the cleanup of PCBs on the river, initiated the characterization of sediment deposits containing PCBs in the impoundment area. In coordination with Ecology, EPA is planning on sampling sediments for Upriver Dam as part of a separate action from the Spokane River Beach Cleanups (but still under the Coeur d'Alene ROD OU3) and making a separate cleanup decision for any remaining metals-contaminated sediment at Upriver Dam.

Two areas, called Deposits, were identified by Ecology for Remedial Action (see appendix A for site overview).

- Deposit 1 – approximately 3.7 acres in deep water (20 to 25 feet below normal pool level) zones near the dam (approximately river mile 80.1 to 80.6), containing dry-weight (dw) surface sediment PCB concentrations up to 1,430 µg/kg. Sub-surface sediments within the deposit contain PCBs at concentrations up to 20 mg/kg. Portions of the deposit or land adjacent to the deposit along the bank are owned by Spokane, while the principal underwater sediments of were located within the bed and banks of the river owned by the state of Washington, under the control of the Department of Natural Resources.
- Deposit 2 – a 0.2 acre shallow water area on north bank side channels near Donkey Island (river mile 83.4), containing surface sediment PCB concentrations up to 330 µg/kg. The upland area is owned by the Washington Department of Parks and Recreation. Some submerged portions, as bed and bank of the river, are owned by the state of Washington, under the control of Department of Natural Resources. Donkey Island is valuable riparian habitat that provides shelter for juvenile salmonids. The proximity of the two backwater channels to known spawning areas for trout and other species enhances the ecological importance of this area.

Ecology's Remedial Action at the Upriver Dam site consisted of placement of a three-layer protective cap on top of sediments containing PCBs in Deposit 1; and excavation and disposal of PCB-contaminated sediments, backfilling with clean sand, and riparian/backwater habitat restoration in Deposit 2.

12.2. Construction Activities

Staging Areas and Site Access

For Deposit 1, the construction staging area was on the south side of the river on the western half of a vacant lot owned by the city of Spokane. The lot is just west of the Gonzaga Crew Facility and north of Felts Field. Delivery trucks and construction equipment entered the site from Trent Avenue to North Waterworks Street, driving around the Police Academy to the staging area. A barge was placed in the Spokane River, just off the south shore behind the dam. Materials were loaded onto the barge by conveyor belt then placed onto the sediments by a derrick,

Two staging areas will be used for Deposit 2. They were located on Washington State Department of Parks and Recreation property. One staging area contained clean sand used as backfill to restore areas that have been cleaned excavated. The other staging location was used temporarily store contaminated sediments removed from Deposit 2. The contaminated sediments were temporarily placed in a contained and lined enclosure. Dewatered sediments and residual water were shipped to an approved disposal facility. Delivery trucks and construction equipment traveled south from North Raymond Road across a field owned by Centennial Properties, Inc., to the staging areas. This route was intended to minimize impacts to neighborhoods, habitat and the Centennial Trail. Flaggers were used on the Centennial Trail as needed during construction to ensure public safety.

Appendix A shows staging locations and access routes for both Deposits.

Archaeological observation

No records of archaeological observation were available for the Upriver Dam site at the time of this report.

Deposit 1 Construction Activities

The cap consisted of the following sequential layers:

- A nominal 6-inch lower layer of granular bituminous coal not less than 4 inches at any location following placement.
- An intermediate nominal 6-inch layer of sand.
- A surface nominal 3-inch cover layer of gravel armor.

The coal layer was constructed in Deposit 1 using precision hydraulic placement of approximately 6 to 8 inches of coal, verified in the field with detailed construction monitoring observations (e.g., sediment profile imaging [SPI] on a nominal 50-foot grid pattern), to ensure that a minimum 4 inches of coal material is placed at all SPI stations. The coal layer was then overlain with a nominal 6 inches of sand, and covered with 3 inches of gravel armor.

Deposit 2 Construction Activities

Construction activities in Deposit 2 included:

- Excavating the top two feet of sediment, thereby removing roughly 95 percent of the sediment-bound PCB mass from the area.
- Backfilling the area with approximately two feet of clean sand to maintain the original grade and isolate any residual PCB-contaminated sediments.
- Transportation of excavated material, including residual water, to a regional landfill facility for disposal.

12.3. Chronology of Events

The chronology of site events is described in Table 12-1.

Table 12-1. Chronology of Events

Date	Activities
2001	Spokane Regional Health District issued the initial PCB fish consumption advisory for areas along the length of the site.
2003	The PCB fish advisory was updated to include tissue analyses from Long Lake (Lake Spokane).
2003-2005	The Remedial Investigation/Feasibility Study was conducted and completed.
2006	Construction activities at Deposit 1 and Deposit 2 were completed.
2008	The first surface and subsurface sediment sampling event and inspection in Deposit 1 was completed. Results suggested that the cap is stable and upward migration of PCBs into the cap is insignificant.
2009	The PCB fish advisory was updated in 2009 with data from 2005, recommending that fish caught from Upriver Dam to the Washington/Idaho state line are not to be consumed; fishing in this stretch of the river is catch and release only.
2010	The second surface and subsurface sediment sampling event and inspection in Deposit 1 was completed. Results suggested that the cap is stable and upward migration of PCBs into the cap is insignificant.

12.4. Performance Standards and Construction Quality Control

The construction of the remedial cap was completed in general accordance with the remedial design plans and specifications. Post-construction monitoring has shown that the capped area is stable, and upward migration of PCBs into the cap has been insignificant.

12.5. Final Inspections and Certifications

Ecology field personnel were on site during all phases of construction activities, and accepted the work completed at the site. A post-construction bathymetric survey of Deposit 1 was completed for use in planning future monitoring events.

12.6. Operations and Maintenance Activities

Surface and subsurface sediment sampling of Deposit 1 were performed two (2008) and four (2010) years post remediation as described in the Operations, Monitoring and Maintenance Plan (OMMP).

Sampling locations were determined by bathymetric surveys conducted prior to each sampling event. Surface sediment sampling focused on the collection of material from the 0 to 10 cm biologically active layer of the cap. A total of two surface samples were collected during each monitoring event. Subsurface sediment sampling consisted of three cores at predetermined locations and another two additional locations located at relatively low spots on the cap based on the pre-sampling event bathymetric surveys. Also during sampling events, visual inspections by divers were conducted to evaluate cap erosion or settlement. The results of the two monitoring events suggest: 1) the cap is intact at all locations, and intact layers of the gravel armor, sand, and coal were observed at all core locations; and 2) PCBs were not detected in cap samples collected from either the sand isolation layer or the underlying coal layer, verifying remedial design predictions of insignificant upward migration of PCBs.

Long-term monitoring and adaptive management of the cap surface will be required to verify the effectiveness of the cap and repair any cap damage or flaws as long as the PCB-contaminated sediments remain.

In coordination with Ecology, EPA is planning on sampling sediments for Upriver Dam as part of a separate cleanup action from the Spokane River Beach Cleanups, but still under Coeur d'Alene ROD OU 3, and making a separate cleanup decision for any remaining metals contaminated-sediment at Upriver Dam.

12.7. Contact Information

Table 12-2 provides contact information for the state oversight lead.

Table 12-2. Contact Information

Project Role	Name	Organization	Address
Ecology Oversight	Zach Hedgpeth	Ecology	Toxics Cleanup Program- Eastern Region Office 4601 North Monroe Street Spokane, WA 99205

Appendix A- Site Overview, Staging Locations, and Access Routes

Fig. 1 Site Overview

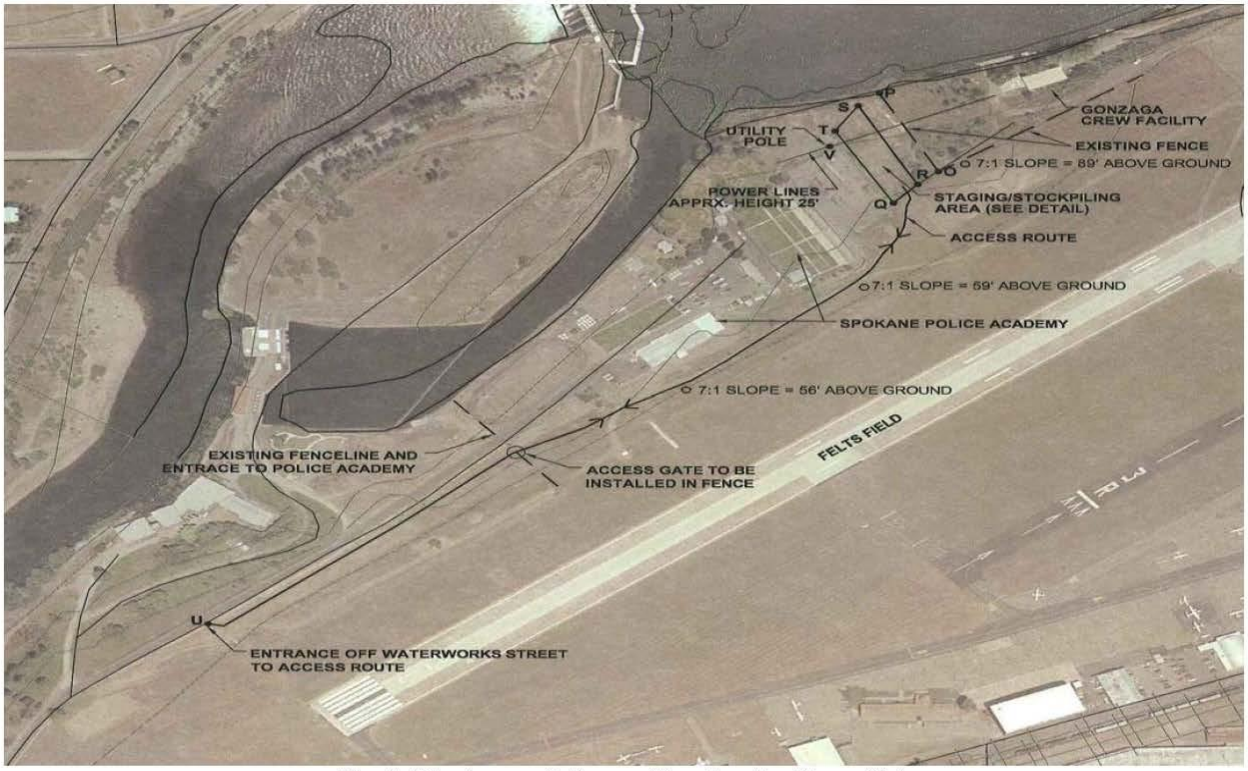

Fig. 2 Staging and Access Routes for Deposit 1

Fig. 3 Staging and Access Routes for Deposit 2